DOCUMENT RESUME

ED 332 684 IR 015 001

AUTHOR	Baldwin, Lionel V.
TITLE	Initiate Instruction in Manufacturing Systems Engineering by Industrial and Government Experts over NTU Satellite Network.
INSTITUTION	National Technological Univ., Fort Collins, CO.
SPONS AGENCY	Fund for the Improvement of Postsecondary Education (ED), Washington, DC.
PUB DATE	89
CONTRACT	G00-8730509-88
NOTE	128p.
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	Communications Satellites; Course Descriptions; *Distance Education; *Educational Television; *Engineering Education; Instructional Innovation; *Learning Modules; Postsecondary Education; Professional Continuing Education; *Teleconferencing; *Videotape Recordings

ABSTRACT

Based on the assumption that there is a need for advanced education among both new graduates of programs for manufacturing engineers and currently practicing engineers, a National Technological University (NTU) project produced instructional modules on manufacturing engineering topics developed by industrial, government, consulting, and academic experts. The learning modules were presented live and interactively via the NTU satellite network. A set of computer-produced visuals accompanied each module, and videotapes were made so that instruction can be edited and/or reused at a later date. The narrative report on this project provides an overview of the project as well as discussions of its purpose, its background and origins, and its results. Universities participating in the NTU network are listed as are the NTU network sponsoring sites. A complete list of more than 80 course topics and dates of presentation is also provided together with a participation summary. Appended materials, which make up the major part of the report, contain descriptive information about individual courses, including the presenter(s) and the schedule for live satellite broadcasts. (DB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

IR

NTU

National Technological University
700 Centre Avenue
Fort Collins, CO 80526
303-484-0668 (FAX)
303-484-6050

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it

☐ Minor changes have been made to improve reproduction quality

● Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

ED332684

Project Title: Initiate Instruction in Manufacturing Systems Engineering by Industrial and Government Experts Over NTU Satellite Network

Grant No.: GOO-8730509-88

Project Dates:
Starting Date: September 15, 1987
Ending Date: September 14, 1989
Number of Months: 24

Grant Award:

Year 1	$ 51,100
Year 2	$ 51,100
Total	$ 102,200

Grantee:
National Technological University
700 Centre Avenue
Ft. Collins, CO 80526

Project Director:
Lionel V. Baldwin
303-484-6050
303-484-0668 (FAX)

Executive Summary:

Manufacturing is very important to the nation's economic health. The U.S. lags in investing in the new technologies employed successfully by our global competitors. Part of the problem is a lack of manufacturing engineers with appropriate advanced educations. The need is for both new graduates with modern manufacturing educations, and updating the current engineering workforce.

This FIPSE grant enabled NTU to develop modules of instruction on manufacturing engineering topics by industrial, government, consulting and academic experts. These live, interactive satellite teleconferences addressed both groups and were clearly successful in reaching the working engineers. The methodology developed during this grant should be adaptable to other disciplines where there is a strong need for technological innovation. Additional incentives, however, appear to be necessary to encourage faculty to widely adopt these videotaped modules into the on-campus curriculum.

IR015001

BEST COPY AVAILABLE

Arizona State University
Boston University
Colorado State University
Georgia Institute of Technology
GMI Engr. & Mgt. Inst.
Illinois Institute of Technology
Iowa State University
Michigan Technological University
North Carolina State University
Northeastern University
Oklahoma State University
Purdue University
Rensselaer Polytechnic Institute
Southern Methodist University
University of Alaska
University of Arizona
University of Florida
University of Idaho
University of Illinois-Urbana
University of Kentucky
University of Maryland
University of Massachusetts
University of Minnesota
University of Missouri-Rolla
University of Notre Dame
University of South Carolina
University of Washington
University of Wisconsin-Madison

Project Overview:

National Technological University (NTU) represents a graduate education consortium that links the campuses of 29 major research universities through a nationwide telecommunications system with over 65 industrial and government agency sponsors. Four channels of interactive color television, each with two-way audio capability, are operated 24 hours each workday. Graduate instruction in five engineering disciplines plus computer science and management of technology is broadcast from the universities and four corporate facilities. Over 10,000 hours of advanced instruction were provided in 1988-89 to technical professionals who participate at their places of work, over 270 locations nationwide. The terrestrial equipment of the current network is conservatively valued in excess of $35 million; the space segment consists of a long-term lease of transponders 5 and 8 on GSTAR-1, a Ku-band satellite. The cooperative commitments of the universities, industrial and government sponsors provides a unique system for innovation in graduate education of technical professionals.

The university consortium sought FIPSE support to employ this satellite-based network to provide instruction not only by university faculty, but also by leading industrial and government experts in manufacturing systems engineering. Manufacturing accounts for over 70 percent of the U.S. wealth producing activities, but our engineering schools have neglected this discipline for over 30 years. Many believe that this lack contributes to the decline in U.S. competitiveness.

At least 17 major studies of the crisis in U.S. competitiveness in recent years have urged the following actions: spur technological innovation by increasing applied research and development; forge bonds between industry and academia; increase the number of graduates in engineering and science, particularly manufacturing systems engineering.

Linkages are particularly critical to manufacturing systems engineering (MSE). Leading faculty are in short supply. Few campuses have the range of talent necessary for a comprehensive program. The NTU network has begun what promises to be a revolution in providing rapid access to research results as well as high quality, economical graduate education.

Over the two year period of the FIPSE grant, NTU developed a self-supporting method to produce modular course segments. Each module is on a coherent topic taught by a leading expert from industry, government, consulting or academia. The instruction is presented live and interactively over the NTU network. A complete set of computer-produced visuals accompanies each module. Videotapes are made so that the instruction can be edited and/or reused at a later date.

Evaluations of these presentations in MSE by industrial practitioners varied from program to program, but were generally in the good-to-excellent range. Attendance charts show a marked increase over the two year period.

An unresolved problem is how to get more university faculty to participate in these programs, and to use the modules in on-campus instruction. NTU staff with the cooperation of the deans of engineering at the 29 participating universities, plans to continue efforts to enlarge faculty adoptions.

The outcome of this project was not only the initiation of instruction in manufacturing systems engineering by industrial and government experts over the NTU satellite network, but also the development of a process to produce modular instruction of high quality in a self supporting manner and the field testing of these modules on a large scale by practitioners. The procedures should prove useful in fields other than MSE. In fact, NTU plans a follow-up project in the area of software engineering.

Purpose:

In the last decade, the U.S. lost jobs to foreign manufacturers at alarming rates. First to erode was U.S. dominance in steel, automobiles, machine tools and other heavy manufacturing. Even more unsettling, we now are experiencing serious slippage in high technology segments such as semi-conductor fabrication, consumer electronics, advanced computer and communications equipment --- where the U.S. traditionally is not challenged.

America now ranks next to the bottom among 13 leading industrialized nations in productivity growth, and this lag in productivity is clearly a culprit in America's declining competitiveness. Economists agree, however, that the U.S. has the lead in technological progress, a strong component of productivity growths. Though the U.S. leads in initial product inventions, it is Japan that wins for bringing down costs and improving quality in the manufacturing stage. This is a critical breakdown for America.

Manufacturing matters mightily to the wealth and power of the U.S. and our ability to sustain an open society. Some economists point to the decline in manufacturing employment from 50 percent of all jobs in 1950 to 20 percent today, and the increase in service jobs to 70 percent of all employment as an economic progression. In their recent book,[1] however, the leaders of the Berkeley Roundtable in International Economy argue that "relying on a shift to services or high technology is irresponsible analysis and perverse policy. At the heart of our argument is a notion we call 'direct linkage': many service jobs are tightly tied to manufacturing. Lose manufacturing and you will lose -- not develop -- those highwage services. Nor is the relationship between high tech and manufacturing, like that between services and manufacturing, a simple case of evolutionary succession. High tech is intimately tied to manufacturing."

Cohen and Zysman conclude that, "If the United States wants to stay on top -- or even high up -- we can't just shift out of manufacturing and into services. Nor can we establish a long-term preserve around traditional blue-collar jobs and outmoded plants. If the United States is to remain a wealthy and powerful economy, American manufacturing must automate, not emigrate. Moreover, it must automate in ways that build flexibility through the imaginative use of skilled labor. In a world in which technology migrates rapidly and financial services are global, the skills of our workforce and the talents of our managers together will be our central resource."

John F. Welch, Jr., CEO of General Electric, asks, "Why should anyone who is not directly involved in manufacturing or who competes only domestically care how the Caterpillars or General Electrics or Motorolas fare in world markets? Those who do not care ignore the linkages between services and manufacturing -- and unfortunately it's one that's often ignored in America today. GE Services businesses are healthy, profitable, and growing. Yet their success is clearly linked to and dependent upon manufacturing industries -- both inside our company and out. As far as our experience goes, the linkage between services and manufacturing -- if not always apparent - is always real."

---

1) Stephen S. Cohen and John Zysman, *Manufacturing Matters: The Myth of a Post-Industrial Economy,* Basic Books, Inc., 1987.

Manufacturing accounts for about 70 percent of the wealth-producing activities in the U.S., but U.S. productivity in manufacturing has been essentially stagnant for the last four years. Growth in U.S. productivity lags far behind that of our foreign competitors. The reason for stagnation is a reluctance to apply the latest technology. **A shortage of manufacturing engineers with advanced educations is viewed by the National Academy of Engineering and others as a critical factor.** There simply is not the skilled talent to "create, apply and protect technology. Innovation spurs new industries and revives mature ones. Technological advances lead to improved productivity, an essential ingredient for our standard of living." This solution--create technology and improve productivity--is urged by the President's Commission on Industrial Competitiveness which was quoted above.

William R. Hewlett, co-founder of Hewlett-Packard Company, addressed the critical shortage of manufacturing engineers at the 1986 M.I.T. commencement as follows: "This challenge is clearly defined by the findings of the President's commission. Modern technology must be used to improve productivity. **We need the same creative effort in the production process that we now lavish on the development phase.** The universities have a real responsibility to provide a theoretical base for quality and efficiency in the manufacturing process."

U.S. universities have neglected manufacturing systems engineering (MSE) for over 30 years. What is manufacturing systems engineering? One need only study the manufacturing operations performed by major automobile companies, General Electric, McDonnell-Douglas and others to realize the importance of a curriculum dealing with Manufacturing Systems Engineering. This discipline concentrates on subjects in Computer-Aided Engineering (CAE), Control Systems for Automation, Robotics, Artificial Intelligence, Inventory Management and the Automated Assembly Process to name a few. For the United States to remain competitive in the manufacturing arena, American engineers must have a firm understanding of the methods and processes necessary to utilize today's technology to produce quality products at an economical cost. In 1967 there was a study done by Arthur D. Little to determine whether MSE could be an academic discipline. At the time, there were only two programs in the country that led to manufacturing engineering degrees. Today, there are only a few more programs in manufacturing engineering - a lot of courses scattered at 240 engineering colleges, but only a few complete programs. No reason for this neglect is known, but it is a fact.

But, **can't the universities be geared up to meet the challenge?** According to Robert M. Anderson, General Electric Manager of Technical Education: "No, because our university system simply cannot handle the rate at which new technologies are impacting American business. And, even if we could afford to take that approach, in the end it would still be somewhat suspect." Anderson explained: "I think **that approach is irresponsible to the existing workforce. What do we do, for example, with all the *existing*, experienced engineers? The only solution that makes any sense is to look at the existing engineering workforce and be more creative about providing retraining opportunities for the new technologies."**

According to a new report by Work in America Institute (WAI), the rapidly accelerating pace of technological change in large organizations calls for a "new, more dynamic corporate training strategy -- one that anticipates new technologies far in advance and helps employees develop skills, not only for today's technology, but for tomorrow's and the day after's. If training programs grow directly out of the business plan, then training becomes as vital as R&D, or equipment maintenance, or capital investment in new technology -- which, in fact, it is," said Jerome M. Roscow, President of the WAI. "The question ceases to be, How much is the right amount to spend on training? and becomes, How much will it cost to acquire the necessary skills?"

A major consortium of universities (Table 1) is using modern satellite telecommunications to provide a linkage between academe and the manufacturing engineering workforce. With FIPSE support, a two-year pilot program shared the best instructional resources of 29 colleges and provided leading-edge courses and seminars to working engineers at their job sites. But even more important for the accelerated development of new curricula at colleges, **key industrial and government experts provided instruction via the satellite network to all U.S. colleges which have an interest in these special services.**

This FIPSE project provided federal support for an innovative partnership between 29 universities and 60 corporations and 5 government agencies. The three-way partnership accelerated reforms in graduate engineering education and encouraged cooperation in the educational use of satellite telecommunications for national concerns. This partnership concept has been widely endorsed by industry, academia, and professional societies.

The basic organizational structure of NTU is well suited to the tasks. The FIPSE Project Director decided to address the two issues outlined above simultaneously. That is, instruction in the new MSE technologies and methods would be addressed to the current engineering workforce (Anderson's imperative), and also made available to faculty for on campus curricula development. This decision led to a modular design on specific sub-topics, rather than full-length, credit course development.

Background and Origins:

The National Technological University (NTU) was established in Colorado as a non-profit, private educational corporation in January, 1984. NTU was created to award masters degrees in selected fields including manufacturing systems engineering (MSE). The academic programs feature approved courses of instruction offered by its 29 universities. By using advanced instructional television and satellite technology to deliver academic programs, students nationwide do not need to leave the workplace to participate in the programs. Each participating university evaluates and records grades for students completing its courses. The student records are transferred by the participating university to the NTU Registrar at the end of each term.

During the two year period of this project, NTU added 5 participating universities which brings the NTU faculty pool to about 25 percent of the U.S. total. Thirteen new uplinks were installed over the two years.

Each NTU site is operated by a sponsoring organization (i.e., the company employing the student) following guidelines provided by NTU. The courses are rigorous, but provide a convenient and flexible alternative to campus study.

Each university provides courses taught by the best teachers of its faculty. Top faculty teaching for NTU via the network is the key to the consortium's success. By means of NTU, outstanding instructors selected from the regional ITV system now have a national impact.

TABLE 1: NTU PARTICIPATING UNIVERSITIES

NTU Code	Participating University	Full Time Engineering Faculty	ITV Classrooms	Network Uplink	TV Studios
W	Arizona State University	165	4	yes	4
V	Boston University	73	3	yes	1
H	Colorado State University	101	7	yes	1
J	Georgia Institute of Technology	322	5	yes	1
@	GMI Engineering & Management Inst.	70	2	yes	2
K	Illinois Institute of Technology	72	8	yes	0
U	Iowa State University	279	2	yes	2
I	Michigan Tech. University	141	2	9/15/90	2
P	North Carolina State University	209	4	yes	2
F	Northeastern University	110	4	yes	1
O	Oklahoma State University	91	2	yes	2
M	Purdue University	280	3	yes	2
Z	Rensselaer Polytechnic Institute	160	1	yes	0
N	Southern Methodist University	43	4	yes	4
G	University of Alaska	22	2	yes	2
E	University of Arizona	171	2	yes	2
R	University of Florida	237	3	yes	2
S	University of Idaho	78	2	yes	1
Q	Univ. of Illinois @ Urbana-Champaign	430	2	yes	0
L	University of Kentucky	116	1	yes	1
B	University of Maryland	160	4	yes	1
A	University of Massachusetts	119	2	yes	2
C	University of Minnesota	201	3	yes	3
T	University of Missouri-Rolla	176	2	yes	0
@	University of Notre Dame	76	0	yes	1
D	University of South Carolina	55	3	yes	6
@	University of Southern California	160	4	yes	1
Y	University of Washington	209	2	yes	1
Z	University of Wisconsin-Madison	204	1	yes	2
		4,530	84	28	49

SPONSORING COMPANY UPLINKS AND STUDIOS

Eastman-Kodak Company	Rochester, NY
Hewlett-Packard Company	Palo Alto, CA
Motorola, Inc.	Schaumburg, IL
NCR Corporation	Dayton, OH

@ participate only in non-credit programs

NTU began regular satellite delivery of advanced technical education in August, 1985. During 1988-89, NTU offered more than 10,000 hours of academic credit instruction. The network is also providing over 1,000 hours each year of non-credit, state-of-the-art programming. The service operates on GSTAR-1 with two modern Ku-band transponders which broadcasts four channels of full-motion, color video throughout the day and evening each workday. This two channels per transponder is a broadcasting first.

Each university has made a contractual commitment with NTU and each has also made a significant financial commitment. For example, each ITV classroom costs at least $100,000 for equipment, so these special facilities are valued at least at $8,400,000. TV studios are $500,000 investments, so 49 have a value of $24,500,000. Each uplink costs in excess of $150,000 installed, so this set of NTU satellite equipment represents over $4,250,000 of investment today. The technical staff to operate the ITV systems is an annual operating expense of over $130,000 at each school. Clearly, the NTU consortium represents a working relationship which is strongly supported at each participating university.

Appendix A is a diagram of the winter quarter/spring semester broadcast schedule for 1990. Note the open times which are available for occasional recitation periods for the courses delivered during the evening. The letter suffix on the course number indicates the originating school as shown on Table 1. For example, on Channel D at 7:45 a.m. Eastern Time each Monday, University of Massachusetts (A) is offering a graduate class in "Control System Design", numbered CT 711-A. This is a live broadcast at the instant this course is taught to campus students.

The NTU ITV system employs the best available methodology which has evolved over the past two decades at the participating universities and other schools. However, the three-hour time zone difference between the east and west coasts, along with both schools and customers in each of the four zones means that NTU must increase the communications opportunities for teachers and students outside of classroom periods. An IBM funded project is now underway with new computer technology to enhance electronic mail and computer conferencing service as a supplement to telephone interaction. Each instructor also has a telephone answering device so questions can be called in at any time and these are answered in the next class period.

Each receiving or downlink site is equipped by the sponsoring organization with a TV receive-only station (TVRO). These installations generally cost about $12,000 and consist of a 3.6 meter antenna or dish (or larger in some areas) with surface tolerance sufficient for Ku-band reception, plus two low-noise amplifiers or block downconverters and two turnable video/audio demodulators or receivers. Color monitors and several programmable 1/2-inch VHS recorder/players complete the receiving station equipment which is often located in small, multi-purpose conference rooms at the corporate sites. Over 270 sites are now participating in the NTU program (Table 2) which is an increase of 170 over the two year period of this project.

TABLE 2: NTU Network Sponsoring Sites

- **Advanced Micro Devices, Inc.**
  - Austin, TX
  - San Antonio, TX
- **AG Communication Systems**
  - Phoenix, AZ
- **Air Products and Chemicals, Inc.**
  - Allentown, PA
- ALCOA
  - Alcoa, TN
  - Alcoa Center, PA
  - Davenport, IA
  - Pittsburgh, PA
  - Rockdale, TX
- **Allied Signal Aerospace Company**
  - Kansas City, MO
  - South Bend, IN
- **Analog Devices, Inc.**
  - Greensboro, NC
- **Armco, Inc.**
  - Ashland, KY
- **Atmel**
  - Colorado Springs, CO
- **AT & T**
  - Allentown, PA
  - Golden, CO
  - Hopewell, NJ
  - Lisle, IL
  - Little Rock, AR
  - Mesquite, TX
  - Middletown, NJ
  - Norcross, GA
  - North Andover, MA
  - Phoenix, AZ
  - Pleasanton, CA
  - Reading, PA
  - Shreveport, LA
  - Skokie, IL
  - Union, NJ
  - Westminster, CO
- **The BDM Corporation**
  - Albuquerque, NM
- **Bellcore**
  - Piscataway, NJ
- **Boeing Aerospace Company**
  - Seattle, WA
- **Boeing Military Airplane Co.**
  - Wichita, KS
- **Booz-Allen & Hamilton, Inc.**
  - Bethesda, MD
- **Bull HN Info. Systems, Inc.**
  - Billerica, MA
  - Phoenix, AZ
- **Burle Industries, Inc.**
  - Lancaster, Pa
- **College Center for the Finger Lakes**
  - Corning, NY
- **CTS Corporation**
  - Berne, IN
- **A Dallas-Based Info. Management Co.**
  - Plano, TX
  - Southfield, MI
- **Deere & Company**
  - Moline, IL
- **Department of Defense**
- Griffis AFB, NY
- Naval Air Development Center
  - Warminster, PA
- Naval Avionics Center
  - Indianapolis, IN
- Naval Research Laboratory
  - Orlando, FL
  - Washington, DC
- Naval Weapons Support Center
  - Crane, IN
- U.S. Army (ARDEC)
  - Picatinny Arsenal, NJ
- U.S. Army Engineer District
  - Rock Island, IL
- U.S. Army Intelligence Ctr & School
  - Fort Huachuca, AZ
- **Department of Energy**
- Lawrence Livermore National Lab.
  - Livermore, CA
- Los Alamos National Laboratory
  - Los Alamos, NM
- Sandia National Laboratories
  - Albuquerque, NM
  - Livermore, CA
- **Digital Communications Associates, Inc.**
  - Alpharetta, GA
- **Digital Equipment Corporation**
  - Andover, MA
  - Augusta, ME
  - Boxboro, MA
  - Colorado Springs, CO
  - Cupertino, CA
  - Greenville, SC
  - Hudson, MA
  - Littleton, MA
  - Marlborough, MA
  - Maynard, MA
  - Nashua, NH
  - Shrewsbury, MA
  - South Burlington, VT
  - Stow, MA
  - Tempe, AZ
  - Tewksbury, MA
- **Eastman Kodak Company**
  - Kingsport, TN
  - Rochester, NY
  - Windsor, CO
- **E.I. du Pont de Nemours & Company**
  - Deepwater, NJ
  - Memphis, TN
  - Newark, DE
  - Orange, TX
  - Parlin, NJ
  - Wilmington, DE
- **General Dynamics Corporation**
  - East Camden, AR
- **General Electric Company**
  - Bridgeport, CT
  - Cincinnati, OH
  - Daytona Beach, FL
  - Erie, PA
  - Florence, SC
  - Lynchburg, VA
  - Lynn, MA
  - North Clarendon, VT
  - Plainville, CT
  - Schenectady, NY (2 sites)
  - Utica, NY
  - Wilmington, NC
- **General Instrument Corporation**
  - Hatboro, PA
  - Hicksville, NY
  - Hunt Valley, MD
  - Nogales, AZ
  - San Diego, CA
- **Georgia Tech. Research Institute**
  - Macon, GA
- **Glenayre Electronics**
  - Quincy, IL
- **GTE Corporation**
  - McLean, VA
  - San Angelo, TX
  - Waltham, MA
- **Harris Corporation**
  - Quincy, IL
- **Hewlett-Packard Company**
  - Andover, MA
  - Avondale, PA
  - Boise, ID
  - Colorado Springs, CO (3 Sites)
  - Corvallis, OR
  - Cupertino, CA
  - Dearborn, MI
  - Everett, WA
  - Fort Collins, CO
  - Greeley, CO
  - Loveland, CO
  - McMinnville, OR
  - Mountain View, CA (2 Sites)
  - Palo Alto, CA (5 Sites)
  - Rockaway, NJ
  - Rohnert Park, CA
  - Roseville, CA
  - San Diego, CA
  - San Jose, CA (2 Sites)
  - Santa Clara, CA
  - Santa Rosa, CA
  - Spokane, WA
  - Sunnyvale, CA
  - Vancouver, WA
  - Waltham, MA

- **Honeywell, Inc.**
  - Brooklyn Park, MN
  - Clearwater, FL
  - Denver, CO
  - Edina, MN
  - Everett, WA
  - Freeport, IL
  - Glendale, AZ
  - Golden Valley, MN (2 Sites)
  - Hopkins, MN
  - Minneapolis, MN (2 Sites)
  - Phoenix, AZ
  - York, PA
- **IBM Corporation**
  - Boca Raton, FL
  - Boulder, CO
  - Bromont, Quebec, Canada
  - Endicott, NY
  - Essex Junction, VT
  - Fishkill, NY
  - Gaithersburg, MD
  - Houston, TX
  - Kingston, NY
  - Owego, NY
  - Poughkeepsie, NY
  - Research Triangle Park, NC
  - Roanoke, TX
  - San Jose, CA (2 Sites)
  - Thornwood, NY
  - Tucson, AZ
- **Illinois Institute of Technology**
  - Chicago, IL
- **Industrial Management Council**
  - Rochester, NY
- **Industry Education Council of Santa Clara County**
  - San Jose, CA
- **Intel Corporation**
  - Chandler, AZ
  - Folsom, CA
  - Hillsboro, OR
  - Rio Rancho, NM
  - Santa Clara, CA
- **IOMEGA Corporation**
  - Roy, UT
- **Kerr-McGee Corporation**
  - Oklahoma City, OK
- **Lawrence Livermore National Laboratory**
  - Livermore, CA
- **Los Alamos National Laboratory**
  - Los Alamos, NM
- **Magnavox Government & Industrial Electronics Company**
  - Ashburn, VA
  - Fort Wayne, IN
- **Martin Marietta Corporation**
  - Bethesda, MD
  - Denver, CO
  - New Orleans, LA
  - Oakridge, TN
  - Piketon, OH
- **Mason & Hanger**
  - Amarillo, TX
- **McDonnell Aircraft Company**
  - St. Louis, MO
- **Mead Data Central, Inc.**
  - Miamisburg, OH
- **Microchip Technology, Inc.**
  - Chandler, AZ
- **Micron Technology, Inc.**
  - Boise, ID
- **Milliken & Company**
  - Spartanburg, SC
- **Mine Safety & Health Administration**
  - Triadelphia, WV
- **The MITRE Corporation**
  - Bedford, MA
  - McLean, VA
- **Motorola, Inc.**
  - Arcade, NY
  - Arlington Heights, IL
  - Austin, TX
  - Fort Worth, TX
  - Northbrook, IL
  - Schaumburg, IL
  - Seguin, TX
- **NASA**
  - Greenbelt, MD
  - Hampton, VA
  - Wallops, VA
- **National Semiconductor Corporation**
  - Puyallup, WA
  - Santa Clara, CA
  - South Portland, ME
  - Tucson, AZ
  - West Jordan, UT
- **NCR Corporation**
  - Cambridge, OH
  - Colorado Springs, CO
  - Dayton, OH (2 Sites)
  - Fort Collins, CO
  - Hauppage, NY
  - Ithaca, NY
  - Lake Mary, FL
  - Liberty, SC
  - Miamisburg, OH
  - Norcross, GA
  - San Diego, CA (2 Sites)
  - Saint Paul, MN
  - Waterloo, Ontario, Canada
  - West Columbia, SC
  - Wichita, KS (2 Sites)
- **Pacific Bell**
  - Pasadena, CA
  - Sacramento, CA
  - San Diego, CA
  - San Ramon, CA
  - Tustin, CA
- **Perkin-Elmer Corporation**
  - Norwalk, CT
- **Polaroid Corporation**
  - Cambridge, MA
  - New Bedford, MA
- **Rockwell International Corporation**
  - Cedar Rapids, IA
- **SRI David Sarnoff Research Center**
  - Princeton, NJ
- **Southern NJ Tech. Consortium**
- Brick Computer
  - Brick NJ
- Cherry Hills Industrial Site
  - Cherry Hills, NJ
- FAA Technical Center
  - Atlantic City, NJ
- PSE & G. Nuclear Training Center
  - Salem, NJ
- **Tektronix Consolidated**
  - Beaverton, OR
  - Grass Valley, CA
  - Wilsonville, OR
- **Texas Instruments, Inc.**
  - Abilene, TX
  - Colorado Springs, CO
  - Dallas, TX (2 Sites)
  - Lubbock, TX
  - Sherman, TX
  - Temple, TX
- **3M Company**
  - Hutchinson, MN
  - St. Paul, MN
- **The Travelers Insurance** Company
  - Hartford, CT
- **U.S. Bureau of Mines**
  - Pittsburgh, PA
- **U.S. Government Agency**
  - Washington, DC
- **U.S. WEST Advanced Tech., Inc.**
  - Englewood, CO
- **Vitacom Corporation**
  - Mountain View, CA
- **Whirlpool Corporation**
  - Benton Harbor, MI
- **Winona State University** (IBM Corp.)
  - Rochester, MN
- **Xerox Corporation**
  - El Segundo, CA
  - Webester, NY

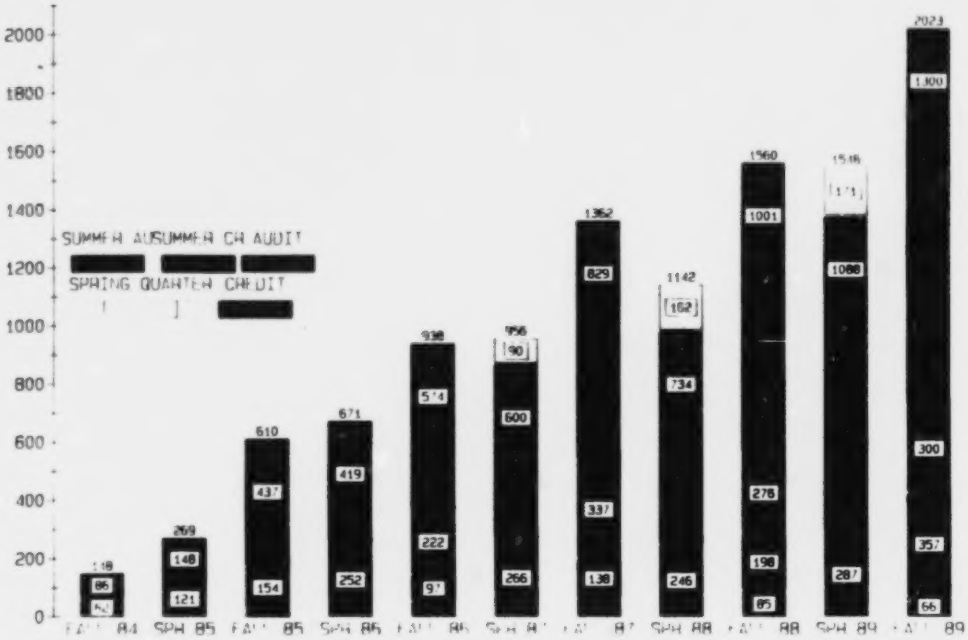
(JULIANNA\LISTS SITES

REVISED: December 12, 1989

Each enrollee is charged tuition and fees whether they register for academic credit or audit. Each participating university sets the tuition for the instruction it provides in the NTU program. This tuition may vary from school to school. Tuition and fees for academic courses for all but three NTU universities are $405 per semester credit hour for credit enrollees and $305 per SCH for auditors. In every instance, the employer either pays this bill directly or reimburses the employee when the course is completed.

Enrollments grew dramatically in August 1985 when satellite delivery began. Figure 1 shows NTU enrollments to date. Enrollments doubled during the two year project period.

FIGURE 1: NTU ENROLLMENT SUMMARY



Project Description:

Broad guidance on which modules to produce was provided by an intensive national study of manufacturing engineering in the 21st century done by A.T. Kearney & Co. for the Society of Manufacturing Engineers (SME). This report, Profile 21,[2] noted the accelerating speed of change of technology and the mounting pressure of global competition. Engineers will need to design for different product characteristics, and employ more advanced technology in the manufacturing processes. Therefore, there continues to be a need for engineers with specialized skills. But SME recommends that the brightest engineers be trained to become operations integrators and manufacturing strategists. This is the "systems" emphasis of MSE.

---

2) Detlef K. Koska and Joseph D. Romano, Profile 21 Executive Summary, *"Countdown to the Future: The Manufacturing Engineer in the 21st Century"*, A. T. Kearney, Inc.

Within this broad framework, the project director sought industrial and government experts through the university consortium, the industrial/government sponsors of NTU and the technical societies which addresses MSE professionals.

To produce a typical 4.5 hour module costs about $12,000 to $15,000. NTU sought joint ventures where NTU covered 40 percent of these costs, and the copyright owner of the intellectual property contributed 60 percent. The agreed goal was to make each module self-supporting from fees charged the students in industry and government. The agreement calls to NTU and the producer to split revenue from the initial broadcast on a 40-60 basis, in line with the cost structure. Universities were offered each module at 40 percent of regular fee to encourage on campus use.

Topic selection was, therefore, based on the joint decision of NTU and the producer that a particular module would be sufficiently needed by the practicing manufacturing engineers to provide for a breakeven operation. About 80 percent of the modules were, in fact, produced in the black.

Faculty could judge each module in the context of that university's on-campus curricula needs. Videotape copies and supporting hard copy material provide the time flexibility needed to match campus schedules to NTU broadcast schedules.

Project Results:

Table 3 lists each module produced in the 1989 grant year, together with the number of industry and government receiving sites and the attendance reported at these sites. In addition, participation by universities is shown in the last two columns.

Details concerning the instructors, the content of each module and the length of each module is shown in Appendix B. Please review this material. Note that many leading authorities participated. Instructors are overwhelming drawn for the expert ranks of industry. Note also the broad range of producers ("sponsored by") including many universities, American Society of Mechanical Engineers, Sigma Xi, and the American Chemical Society. There is an excellent mix of male and female instructors.

The modules developed during this project clearly met the primary objective, and by designing for ultimate financial self sufficiency, created a more general methodology which can extend beyond the project period in MSE, and in the future be extended to other curricula development areas such as software engineering.

A problem area needing additional effort is to enlarge university participation, and subsequent use of the modules in on-campus instruction. Please note, however, that MSE may be a particularly difficult field for campuses because of low student interest. For example, Table 4 shows NTU students choose MSE at about 20 percent the rate of other majors (MOT is new and special), or less than 5 percent of the total admissions by major. In other words, faculty may continue to neglect MSE on campus because student demand is low. Why low student demand if there is in fact a national shortage? Many interviews with students and employers leads the project director to believe that the country is in a transition. Manufacturing is still suffering from the effects of record interest rates of the 1980's. As industry recovers, the demand for MSE graduates is likely to be clear, so student interest in the 1990's should increase.

NTU will test this hypothesis in the 1990-91 period when it applies the FIPSE techniques of module development to software engineering where we have evidence that student demand (and industry demand) is great.

Incidentally, Table 3 is a chronological list with the most recent modules listed first. Note that attendance generally increases in the more recent programs. This is clear evidence that the modules have developed a good reputation for excellence in the world of producing manufacturing engineers.

Summary and Conclusions:

The FIPSE project demonstrates that the cooperative effort of industry, government and academia through the NTU network can be used to create high quality, state-of-the-art modules of instruction. The methodology should be generalizable to other discipline areas, so long as the technological need for innovation is substantial. It remains to be proven, however, that many faculty will adopt the modules so produced for on-campus instruction. Additional incentives may be necessary.

TABLE 3
NTU MANUFACTURING RELATED TOPICS
Industry/University Participation Summary

Program Date	Program Title	No. Ind./ Gov. Sites	No. Ind./Gov. Attendees	No. Univ. Sites	No. Univ. Attendees
12/1-8-15/89	Finance for Non-Financial Mgrs.	28	143	1	2
12/5-6/89	Effective Tools for Facility Plng.	28	113	3	15
11/28/89	Integrating the Tech. and Human Elements of Flexible Factory Auto.	8	37	0	0
11/17/89	Quality Engineering by Design: Taguchi Approach	32	196	2	16
11/16-17/89	The Manager as Leader: A Program for Effective Leadership	24	69	1	3
11/14-15/89	Cross Functional Management	36	175	2	20
11/13/89	Engineering Use of Adhesive	18	80	0	0
11/1/89	Intelligent Robotics & Mfg.	7	15	2	5
10/27/89	Vendor Certification	19	71	0	0
10/25/89	Manufacturing Intl. '88 Conference-Highlights and Benefits to Ind.	18	118	8	106
10/24-31, 11/7-14/89	**Quest for Quality: An NTU Special Series**	**75**	**3495**	**5**	**88**
11/14/89	Getting People to Commit to Quality	5	28	1	9
11/14/89	Total Quality Management	4	15	1	7
11/7/89	Supplier Quality Improvement as a Purchasing Business Plan	5	39	0	0
11/7/78	Engineering Quality into Product Design	8	63	1	22
11/7/89	Kaizen: An American Approach	4	18	0	0
10/31/89	Quality in Manufacturing: Let Your Process Do Your Talking	7	53	2	28
10/31/89	Higher Quality/Lower Risk in R&D	4	26	0	0
10/31/89	Six Sigma: TQC, American Style	5	37	0	0
10/24/89	Quality Improvement as a Business Strategy	2	16	0	0
10/24/89	Quality Improvement in Admin.	2	24	0	0
10/24/89	Standards in Quality and the Malcolm Baldrige Award	4	17	0	0
10/19-20/89	Practical Tools for Functional Mgrs.	12	23	0	0
10/19-11/89	Surface Contamination and Cleaning	12	106	1	7
9/28-29/89	Indoor Air Quality	19	100	1	2
9/6-8-15/89	Simulation Analysis using Siman	8	12	1	1
8/31/89	Manufacturing Simulation	26	76	1	1
8/29/89	Application of Data Dependent Sys. in CAD & Manufacturing Design	4	5	0	0

8/25/89	Fundamentals of Ind. Ventilation	10	64	1	1
8/17-18/89	Project Mgmt. for the 90's	31	137	1	1
8/15-16/89	Statistical Process Control and Applied Statistics	15	60	0	0
8/9/89	The Art of Managing People	32	150	1	5
7/28-8/4-11/89	The Write Design	23	167	0	0
8/2/89	Using Statistical Process Control for Quality Improvements	34	161	2	5
7/27-28/89	Quality Engineering Using Robust Design	41	359	2	31
7/12/89	Communication Skills for Success	32	126	4	17
7/20/89	Motorola's Process for Managing Qlty. & The Malcolm Baldrige Award	119	579	6	122
JUL-DEC 1989	**Performance Workplace: Leadership Teamwork & Quality**				
12/4-11-18/89	Getting Results: The Bottom Line	78	447	3	10
11/6-13-20-27/89	Developing People	82	1290	5	76
10/9-16-23-30/89	Commitment vs. Control in the Workplace	80	1271	3	8
9/11-18-25, 10/2/89	Leadership through Empowerment	87	1338	4	24
8/7-14-21-28/89	Leadership Strategies:	76	970	4	11
7/10-17-24-31/89	Technical Professionals as Leaders: An Evolving Role	76	776	2	5
6/12/89	A Day with Dr. Ed. Deming	13	733	0	0
5/26/89	Managing Mfg. Competitiveness	27	77	2	5
5/24/89	Peter F. Drucker Seminar	13	108	0	0
5/3/89	Concurrent Engineering of Product and Process: A New Challenge	IEEE Course	Registration data not available		
5/2-3/89	Forum on Global Change and Our Common Future -Sigma Xi	8	Not Avail	43	Not Avail
5/2/89	Creative Alliances	12	80	1	23
4/25/89	Manufacturing Competitiveness and Quality by Design	32	275	2	12
4/21/89	Making Tomorrows Polymers	8	77	0	0
4/19/89	Japanese Advanced Sensor Technology	14	58	2	11
4/14/89	Behavioral Flexibility	23	312	0	0
4/3/89	Needs, Possibilities and Guidelines for Advanced Manufacturing	42	207	5	86

3/20-21-22, 23-24/89	**Technology and Management Symposium**	**72**	**2270**	**8**	**948**
3/24/89	Masters of Persuasion				
3/24/89	Integrity and Service Assurance				
3/23/89	Biological and Artificial Neural Networks				
3/23/89	Toward the Millennium	1	6	0	0
3/23/89	Composite Materials				
3/22/89	Total Quality Management through Variability Reduction	2	7	0	0
3/22/89	Why Do Managers Mismanage?				
3/21/89	Renewal Factor				
3/21/89	Data Networking: The Merging of Local Area and Wide Area Networks	1	6	0	0
3/20/89	Making Work Fun				
3/20/89	Signal Processing with Superconductive Circuits				
3/20/89	Zero Sum Solution	1	6	0	0
2/28/89	Engineering Management: Managing High Tech Professionals	19	105	0	0
2/10/89	The Strategic Manager: Planning in a Technical Environment	38	164	0	0
2/1/89	Semiconductor Processing Overview	14	117	0	0
12/13/88	Winning The Productivity Race	38	169	2	44
12/12/88	Environmental Mgmt. to Reduce Your Corp. and Personal Liabilities	9	34	1	1
11/28/88	Reducing Corp. Risk Through Proper Hazardous Waste Disposal	8	21	2	2
11/22-29, 12/6/88	Correctly Applying Statistical Process Control Tools	36	232	1	1
11/21/88	How to Prepare Your Firm For an Environmental Audit	8	38	2	2
11/14/88	Managing Your Company with Tom Peters	19	377	0	0
10/28/88	Design and Synthesis of Ceramic Materials	14	73	1	2
10/7-11-13/88	Planning and Managing a CIM Initiative	19	125	1	1
10/18-19/88	Surface Contamination and Cleaning	29	178	1	3

TABLE 4:

ADMISSIONS STATISTICS BY MAJOR JANUARY 4, 1990

MAJOR	STUDENTS ADMITTED TO DEGREE PROGRAMS	STUDENTS STILL IN ADMISSION PROCESS	STUDENTS DENIED ADMISSION	DEGREES PREVIOUSLY CONFERRED
COMPUTER ENGINEERING	181	36	20	14
COMPUTER SCIENCE	173	58	34	22
ELECTRICAL ENGINEERING	184	45	4	11
ENGINEERING MANAGEMENT	172	44	31	10
MANUFACTURING SYSTEMS ENGINEERING	42	18	5	1
MANAGEMENT OF TECHNOLOGY	31	0	0	0
MATERIAL SCIENCE	3	5	0	0
UNSPECIFIED MAJOR	1	0	0	0
TOTALS	787	206	89	58

NTU WINTER QTR-SPRING SEM 1990

COURSES IN ITALICS ARE LIVE BROADCASTS

Eastern		Midnight	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	Noon
Central		23:00	Midnight	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00
Mountain		22:00	23:00	Midnight	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00
Pacific		21:00	22:00	23:00	Midnight	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00
SUN	A	BM720-A 00:05-02:50			SE750-P 03:00-05:45									
	B	CC763-J 00:10-02:55			MS712-N 03:05-06:10			CC566-Q 06:15-09:00						
	C	PS735-O 00:20-03:05			MP730-Y 03:10-07:55			BR335-X 06:00-08:45						▨
	D	IO570-T 00:15-03:00			BR302-A 03:15-06:00			IO710-F 06:10-09:45						▨
MON	A	CC763-R 00:05-00:55	EF735-U 01:00-01:50 MP721-Y 01:55-03:25		CC760-F 03:30-05:10		IC720-F 05:15-06:55		IS710-R 07:00-07:50 CM721-R 07:55-08:45		*SP773-D* *09:00-10:15*		ADVANCED	TECHNO
	B	IO530-T 00:10-01:00	EF710-C 01:10-02:00	PO570-O 02:05-02:55	EF510-T 03:00-03:50	MC721-P 04:00-04:50	IO735-T 05:05-05:55	CS540-N 06:00-07:00	ST731-U 07:05-07:55	IO560-T 08:05-08:55	*BR320-V* *09:00-09:50* CS511-I 09:55-10:45		ADVANCED	TECHNO
	C	IO580-S 00:05-01:05	CC740-B 01:20-02:35	IC740-B 02:40-03:55		IS714-B 04:00-05:15	CA512-B 05:20-06:35	CS720-B 06:40-07:55		*MA760-F* *08:00-09:40*	*CC715-F* *09:50-11:30*		▨	▨
	D	MA781-A 00:40-01:30	CM530-S 01:35-02:25	EM531-I 02:30-03:20	MA745-J 03:25-04:15	PO770-A 04:20-05:10	ST741-A 05:15-06:05	MS750-P 06:10-07:00	ST740-A 07:05-07:55	*CT711-A* *08:00-08:50*	*IO770-A* *09:05-09:55*	*IC727-A* *10:10-11:00*	▨	▨
TUE	A	IS770-D 00:10-01:30		CT710-F 02:10-03:50		CC770-H 04:00-05:15	MB540-A 05:20-06:35	IC745-D 06:40-07:55		*CS530-B* *08:00-09:15*	*AD510-B* *09:30-10:45*		ADVANCED	TECHNO
	B	CR750-U 00:15-01:05	CC740-E 01:15-02:30	IO773-E 02:35-03:50	IO510-T 03:55-05:10		EM716-E 05:15-06:30	CM720-C 06:35-07:50		*MB560-A* *08:00-09:30*	*MS721-P* *09:35-10:50*		ADVANCED	TECHNO
	C	BR308-S 00:05-00:55	CT711-X 01:00-02:15	DS560-A 02:20-03:35	CC710-O 03:40-04:55		CA720-S 05:00-06:40	SE570-U 06:45-08:00		▨	MB510-T 09:00-10:00	*CS740-H* *10:00-11:15*	*DS780-A* *11:15-12:30*	
	D	CC784-P 00:20-01:10	MC731-P 01:20-02:35	EF530-A 02:40-03:55		PO710-P 04:00-05:15	CR722-P 05:20-06:35	MB530-T 06:40-07:55		▨	*BR350-V* *09:00-09:50*	*ST751-E* *10:00-11:15*		*MT721-#* *12:05-13:20*
WED	A	CC763-R 00:05-00:55	EF735-U 01:00-01:50 MP721-Y 01:55-03:25		CC760-F 03:30-05:10		IC720-F 05:15-06:55		IS710-R 07:00-07:50 CM721-R 07:55-08:45		*SP773-D* *09:00-10:15*		ADVANCED	TECHNO
	B	IO530-T 00:10-01:00	EF710-C 01:10-02:00	PO570-O 02:05-02:55	EF510-T 03:00-03:50	MC721-P 04:00-04:50	IO735-T 05:05-05:55	CS540-N 06:00-07:00	ST731-U 07:05-07:55	IO560-T 08:05-08:55	*BR320-V* *09:00-09:50* CS511-I 09:55-10:45		ADVANCED	TECHNO
	C	IO580-S 00:05-01:05	CC740-B 01:20-02:35	IC740-B 02:40-03:55		IS714-B 04:00-05:15	CA512-B 05:20-06:35	CS720-B 06:40-07:55		*MA760-F* *08:00-09:40*	*CC715-F* *09:50-11:30*		▨	▨
	D	MA781-A 00:40-01:30	CM530-S 01:35-02:25	EM531-I 02:30-03:20	MA745-J 03:25-04:15	PO770-A 04:20-05:10	ST741-A 05:15-06:05	MS750-P 06:10-07:00	ST740-A 07:05-07:55	*CT711-A* *08:00-08:50*	*IO770-A* *09:05-09:55*	*IC727-A* *10:10-11:00*	▨	▨
THU	A			CT710-F 02:10-03:50		CC770-H 04:00-05:15	MB540-A 05:20-06:35	IC745-D 06:40-07:55		*CS530-B* *08:00-09:15*	*AD510-B* *09:30-10:45*		ADVANCED	TECHNO
	B	CR750-U 00:15-01:05	CC740-E 01:15-02:30	IO773-E 02:35-03:50	IO510-T 03:55-05:10		EM716-E 05:15-06:30	CM720-C 06:35-07:50		*MB560-A* *08:00-09:30*	*MS721-P* *09:35-10:50*		ADVANCED	TECHNO
	C	BR308-S 00:05-00:55	CT711-X 01:00-02:15	DS560-A 02:20-03:35	CC710-O 03:40-04:55		CA720-S 05:00-06:40	SE570-U 06:45-08:00		▨	MB510-T 09:00-10:00	*CS740-H* *10:00-11:15*	*DS780-A* *11:15-12:30*	
	D	CC784-P 00:20-01:10	MC731-P 01:20-02:35	EF530-A 02:40-03:55		PO710-P 04:00-05:15	CR722-P 05:20-06:35	MB530-T 06:40-07:55		▨	*BR350-V* *09:00-09:50*	*ST751-E* *10:00-11:15*		*MT721-#* *12:05-13:20*
FRI	A	CC763-R 00:05-00:55	EF735-U 01:00-01:50		MA740-K 03:20-06:55				IS710-R 07:00-07:50 CM721-R 07:55-08:45	BR304-D 08:50-10:50			ADVANCED	TECHNO
	B	IO530-T 00:10-01:00	EF710-C 01:10-02:00	PO570-O 02:05-02:55	EF510-T 03:00-03:50	MC721-P 04:00-04:50	IO735-T 05:05-05:55	CS540-N 06:00-07:00	ST731-U 07:05-07:55	IO560-T 08:05-08:55	*BR320-V* *09:00-09:50* CS511-I 09:55-10:45		ADVANCED	TECHNO
	C	IO580-S 00:05-01:05	CC730-F 01:10-04:35			EP710-N 04:50-08:00				CS770-A 08:15-11:00			▨	▨
	D	MA781-A 00:40-01:30	CM530-S 01:35-02:25	EM531-I 02:30-03:20	MA745-J 03:25-04:15	PO770-A 04:20-05:10	ST741-A 05:15-06:05	MS750-P 06:10-07:00	ST740-A 07:05-07:55	*CT711-A* *08:00-08:50*	*IO770-A* *09:05-09:55*	*IC727-A* *10:10-11:00*	▨	▨
SAT	A	IS770-D 00:10-01:30	CC714-F 01:35-05:10				MA340-U 05:15-08:00			EM770-F 08:05-12:00				
	B	CR750-U 00:15-01:05	EF710-C 01:10-02:00	IO541-S 02:10-05:10			CM713-B 05:15-08:00			EM780-F 08:05-12:00				
	C	BR308-S 00:05-00:55	DS730-A 01:00-03:45			CC714-N 04:00-06:45			SP514-I 07:00-09:45			▨	▨	▨
	D	CC784-P 00:20-01:10	CC770-E 01:15-04:00			AE712-Y 04:05-06:50			CC718-O 07:00-09:45			▨	▨	▨

DEC-18-89

BEST COPY AVAILABLE

NTU WINTER QTR-SPRING SEM 1990

DEC-18-89

Eastern		Noon	13: 00	14: 00	15: 00	16: 00	17: 00	18: 00	19: 00	20: 00	21: 00	22: 00	23: 00	Midnight
Central		11: 00	Noon	13: 00	14: 00	15: 00	16: 00	17: 00	18: 00	19: 00	20: 00	21: 00	22: 00	23: 00
Mountain		10: 00	11: 00	Noon	13: 00	14: 00	15: 00	16: 00	17: 00	18: 00	19: 00	20: 00	21: 00	22: 00
Pacific		09: 00	10: 00	11: 00	Noon	13: 00	14: 00	15: 00	16: 00	17: 00	18: 00	19: 00	20: 00	21: 00
SUN	A					*COURSES IN ITALICS ARE LIVE BROADCASTS*								
	B													
	C													
	D													
MON	A	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	*ST750-N* *17: 00-18: 00*	*EF720-N* *18: 00-19: 30*	*CC786-N* *19: 30-22: 30*			CC750-J 22: 35-00: 05		
	B	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	*PD732-P* *17: 45-19: 00*		GM740-A 19: 15-22: 00			CA712-C 22: 55-00: 10		
	C		*CC712-E* *13: 00-13: 50*	*SP720-Z* *14: 00-15: 30*									IC545-H 23: 10-24: 00	
	D		*DS565-U* *13: 10-14: 00*	*ST733-Q* *14: 00-14: 50*	*IS530-H* *15: 10-16: 00*								PD540-H 23: 05-23: 55	
TUE	A	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	CS740-P 17: 15-18: 30	CA714-A 18: 35-19: 50	CA720-H 19: 55-21: 10		EM717-E 21: 15-22: 30	IO772-E 22: 40-23: 55		
	B	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	*IS710-C* *17: 15-18: 30*	MB550-B 18: 35-19: 25	CA720-A 19: 30-20: 45		IC540-A 21: 05-22: 20	CM741-C 22: 25-23: 40		
	C		*CS740-A* *13: 00-14: 15*	*AE750-P* *14: 20-15: 35*					*CC789-N* *19: 30-22: 30*			CC510-M 22: 35-00: 05		
	D	*MT721-#* *12: 05-13: 20*	*AD741-C* *13: 45-15: 00*						*IO720-B* *19: 00-21: 45*			CA510-B 22: 15-23: 30		
WED	A	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	*ST750-N* *17: 00-18: 00*	*EF720-N* *18: 00-19: 30*	*CC786-N* *19: 30-22: 30*				*GM710-G* *23: 00-02: 00*	
	B	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	*PD732-P* *17: 45-19: 00*		*EF530-K* *19: 20-22: 10*					
	C		*CC712-E* *13: 00-13: 50*	*SP720-Z* *14: 00-15: 30*									IC545-H 23: 10-24: 00	
	D		*DS565-U* *13: 10-14: 00*	*ST733-Q* *14: 00-14: 50*	*IS530-H* *15: 10-16: 00*								PD540-H 23: 05-23: 55	
THU	A	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	CS740-P 17: 15-18: 30	CA714-A 18: 35-19: 50	CA720-H 19: 55-21: 10		EM717-E 21: 15-22: 30	IO772-E 22: 40-23: 55		
	B	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	*IS710-C* *17: 15-18: 30*	MB550-B 18: 35-19: 25	CA720-A 19: 30-20: 45		IC540-A 21: 05-22: 20	CM741-C 22: 25-23: 40		
	C		*CS740-A* *13: 00-14: 15*	*AE750-P* *14: 20-15: 35*					CA710-C 19: 15-22: 00			CC510-M 22: 35-00: 05		
	D	*MT721-#* *12: 05-13: 20*	*AD741-C* *13: 45-15: 00*						*CS750-K* *19: 20-22: 10*			CA510-B 22: 15-23: 30		
FRI	A	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	*ST750-N* *17: 00-18: 00*		*IO721-K* *19: 20-22: 10*			CC750-J 22: 35-00: 05		
	B	*TECHNOLOGY*		*AND*	*MANAGEMENT*	*PROGRAMS*	IO760-G 17: 00-20: 00			CC710-R 20: 05-22: 50		CA712-C 22: 55-00: 10		
	C		*CC712-E* *13: 00-13: 50*	*MT720-#* *14: 00-17: 00*									IC545-H 23: 10-24: 00	
	D		*DS565-U* *13: 10-14: 00*	*ST733-Q* *14: 00-14: 50*	*IS530-H* *15: 10-16: 00*								PD540-H 23: 05-23: 55	
SAT	A													
	B													
	C													
	D													

BEST COPY AVAILABLE

Live Satellite Broadcast

Finance for Non-Financial Managers

Presented by William Nichols, Kenneth Milani and John Halloran

Friday, December 1, 1989
Friday, December 8, 1989
Friday, December 15, 1989
11:00 AM - 5:00 PM Eastern Time
Channel B

Gain a thorough understanding of the role of accounting and finance in the success of the business enterprise.

Managers who complete this course will be better informed and more comfortable with the financial control and reporting of their department's operations.

(See other side for course description)

Sponsored by: University of Notre Dame

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

William Nichols
is professor of accountancy at the University of Notre Dame.

Kenneth Milani
is professor of accountancy at the University of Notre Dame.

John Halloran
is associate professor of finance at the University of Notre Dame.

Course Code:
MC891201B1

BEST COPY AVAILABLE

Finance for Non-Financial Managers

December 1, 8 and 15, 1989
11:00 AM - 5:00 PM Eastern Time
Channel B

COURSE OUTLINE

The language of business is money. Successful managers appreciate the need to fully understand accounting and finance. Unfortunately, in many instances individuals promoted to administrative positions have never been exposed to the process of generating, analyzing and utilizing accounting and financial reports.

Key topics that will be covered in this course are:

- **Introduction to Basic Accounting**
  Accounting concepts
  Accounting terminology
  Basic financial statements
  Published annual reports

- **Cost Information and Decision Making**
  Cost systems
  Cost behavior
  Depreciation
  Inventory cost flow assumption
  Cost-volume-profit analysis

- **Financial Statement Analysis**
  Sources & uses of funds statements
  Ratio & trend analysis
  Return on investment techniques
  Ratios as means of liquidity & profitability
  Uses & limitations of ratio analysis

- **Financial Planning**
  Operating leverage
  Financial leverage
  Proforma statements

- **Operating Budgets**
  Budget environments
  Fixed and variable budgets
  Analysis of variances
  Planning & control aspects of budgeting

- **Capital Budgeting**
  Time value of money
  Cash flow projection
  Accept-reject criteria
  Risk & uncertainty

COURSE OBJECTIVE

To provide a thorough understanding of the role of accounting and finance in the success of the business enterprise. Managers who complete this seminar will be better informed and more comfortable with the financial control and reporting of their department's operations.

INTENDED AUDIENCE

The seminar should be attended by non-financial managers and professionals, including: engineering managers, R&D managers, career engineers and scientists, manufacturing managers, project directors, purchasing managers, human resource managers, marketing managers and sales managers.

COURSE MATERIALS

One set of course notes will be sent to each registered site to be reproduced for each student. Students will find a hand calculator useful.

MORE ABOUT THE PROFESSORS

Dr. William Nichols
currently serves on the editorial review boards of *The Michigan CPA* and the *Journal of Accounting Education*. A CPA, he has been on leave as a visiting professor at Washington University in St. Louis and Northeastern University since joining the Notre Dame faculty in 1977. He has a doctorate from Florida State University.

Dr. Kenneth Milani
is a CPA whose published works center on budgeting, inventory and taxation. He has a doctorate from the University of Iowa and has been on the Notre Dame faculty since 1972.

Dr. John Halloran
has a doctorate from Washington University. His interests lie in the areas of financial institutions and corporate finance. He co-authored *Introduction to Financial Management*, which was published in 1984.

Live Satellite Broadcast

Effective Tools for Facility Planning

Presented by William Wrennall, Arne Thesen and Don Schramm

Tuesday, December 5, 1989
Wednesday, December 6, 1989
11 AM - 5 PM Eastern Time
Channel B

If you are a facility planner, enroll to increase your effectiveness. If you are in a facility management position for your business or industry, learn what you need to make informed decisions about space planning consultants.

In today's facility planning and management environment, you need the best tools available. This course will:

- Improve your capabilities by building on what you already know
- Help you integrate facility planning operation with facility management goals
- Allow you to produce better plans faster
- Guide you through commercially available computerized approaches to facility design
- Show you how to assess your computer needs

(See other side for course description)

Sponsored by: University of Wisconsin-Madison

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

William Wrennall
is president of the Leawood Group in Leawood, Kansas. He holds a B.Sc. degree from Durham University in England and an M.A. degree from Macquarie University in Australia. For the past 10 years he has been working with high-tech industries in the areas of computer-aided space planning and management development. He is a senior member of IIE and CASA/SME, a Fellow of the Institute of Management Science, and past president of the World Federation of Productivity Science.

Arne Thesen
is a professor of industrial engineering and computer sciences at the University of Wisconsin-Madison. Active in the simulation field for more than 20 years, he has a research program in the area of expert scheduling systems. He has worked with numerous companies, including Alcoa, IBM, AT&T and Allen-Bradley. Dr. Thesen's text, *Computer Methods in Operation Research*, has been translated into Japanese and Chinese.

Don Schramm
is an architect and program director in the Department of Engineering Professional Development, University of Wisconsin-Madison. He coordinates continuing education programs on facility management, the use of microcomputers for building and construction, and building energy systems.

Course Code:
MC891205B1

Effective Tools for Facility Planning

December 5 and 6, 1989
11 AM - 5 PM Eastern Time
Channel B

Course Description

The course will be divided into two major topics: space planning basics (fundamentals of space planning and techniques for facility planning) and using computers (the role of computers in facility planning, computer simulation language and techniques, and facility simulation case study).

Course Outline

Space Planning Basics

Fundamentals of Space Planning

- The systematic approach to facility planning
- Planning/design consequences
- Organizational settings
- Project phases
- Planning, implementation and monitoring

Techniques for Facility Planning

- Determining relationships
- Converting data to requirements
- Flows and patterns
- Layout procedures
- Space standards
- Integrating facility management with facility planning
- Case studies

Using Computers

Role of Computers in Facility Planning

- Types of computer support
- Justification procedures
- Hardware/software issues
- Decision-making systems
  projections
  adjacency analysis
  stacking and blocking
  cost analysis
- CAD systems
  space needs
  graphic inventory
  2-D or 3-D
  as-builts
- Management systems
  project management
  real estate
  maintenance
  personnel
- Some limitations
- Benefits and costs

Computer Simulation Languages and Techniques

- Overview of available tools
- Micro vs. mainframe
- Selection criteria
- Time and staff requirements

Facility Simulation Case Study

Intended Audience

Persons involved in the design or management of any building will benefit from this course, which is for independent design consultants or in-house facility managers. The course will meet the special needs of facility planners, managers and executives, architects, interior designers, plant engineers, industrial engineers and property managers.

Course Materials

One set of course notes will be sent to all registered sites to be reproduced for each participant.

Live Satellite Broadcast

Integrating the Technical and Human Elements of Flexible Factory Automation

Presented by Dr. Ann Majchrzak

Tuesday, November 28
11:00 AM - 5:00 PM Eastern Time
Channel B

When planning to buy advanced manufacturing technology (AMT), what issues must be considered?

This course will examine the human elements involved (such as job design, training and pay) as well as the technical.

Intended audience: Technical professionals and managers, including engineers, automation project team members, and plant managers responsible for the design of AMT.

(See other side for course description)

Sponsored by: University of Southern California

For more information, contact your site coordinator or call NTU at (303) 484-0565

Dr. Ann Majchrzak is an associate professor of human factors at the University of Southern California.

She is the author of *Human Side of Factory Automation, Human Aspects of CAD*, and the HIIS tool (Human Infrastructure Impact Statement).

NTU
Advanced Technology & Management Programs

Course Code:
MC891128B1

Integrating the Technical and Human Elements of Flexible Factory Automation

Tuesday, November 28, 1989
11:00 AM - 5:00 PM Eastern Time
Channel B

Course Objectives

This course will provide participants with a framework for identifying the human and organizational issues that need consideration when planning the purchase of advanced manufacturing technology (AMT) and for integrating these issues into the AMT design process.

Course Description

The detrimental effects of inadequate integration of the technical and human elements of AMT are wide ranging. They can be felt in longer payback periods, low machine utilization, high rework, poor throughput, missed delivery schedules and limited capacity increases.

There is a definite need to understand the human and technical elements that affect successful integration. A framework, options, and specific tools for achieving this goal are presented. Topics include:

- The range of human elements likely to be affected by AMT (direct and indirect job designs, organizational structure, training, procedures, and pay).
- Identifying critical technical features likely to create certain minimal human requirements to meet AMT's expected benefits for the organization.
- How to consider critical human elements during the design of AMT plans.
- Assessing the organization's readiness to accept changes in human elements so that the minimal human requirements will be in place when AMT arrives.

Audience

Technical professionals and managers, including engineers, members of automation project teams, and modernization and plant managers who are responsible for the design and implementation of advanced manufacturing technology.

Course Materials

One set of course notes will be sent to all registered sites to be reproduced for each participant.

Tape-Delayed Satellite Broadcast

Quality Engineering by Design: An Introduction to the Taguchi Approach

Presented by Thomas B. Barker

Members' Choice
Friday, November 17, 1989
11:00 AM - 3:00 PM Eastern Time
Channel A

Dr. Genichi Taguchi looks at quality as the characteristic that avoids a loss to society from the time the product is shipped. He has a complete and integrated system to develop specifications, engineer to these specifications, and manufacture the product to specifications. A dramatic improvement in productivity is associated with use of these methods.

This program is designed to help minimize unwanted variability, giving greater customer satisfaction and reducing manufacturing waste.

(See other side for course description)

Thomas B. Barker is a member of the faculty of the Center for Quality and Applied Statistics at the Rochester Institute of Technology. He is one of the most experienced instructors on the Taguchi approach to quality engineering by design.

Sponsored by: Rochester Institute of Technology
Center for Quality and Applied Statistics

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Course Code:
MC891117B1

Quality Engineering by Design: An Introduction to the Taguchi Approach

Friday, November 17, 1989
11:00 AM - 3:00 PM Eastern Time

Course Objectives

This program is aimed at trying to minimize unwanted variability in order to give greater customer satisfaction and reduce manufacturing waste.

Dr. Genichi Taguchi looks at quality as the characteristic that avoids a loss to society from the time the product is shipped. He has a complete and integrated system to develop specifications, engineer to these specifications, and manufacture the product to specifications. A dramatic improvement in productivity is associated with use of these methods.

Course Description

The following topics will be included in this course:

- An introduction to quality engineering by design (QED).
- The loss function.
- The philosophy of experimental design.
- Methods of experimental design.
- An example of the QED process.
- Questions and answers.

Audience

All technical professionals in the fields of engineering, quality, manufacturing, and management. Many professionals have a beginning foundation of quality management and applied statistics. This program would be the next logical step for those interested in a more advanced use of applied statistics.

Course Materials

One set of course notes, including all program visuals, exercise sheets, and formulas, to be reproduced for each participant will be sent to all registered sites.

Live Satellite Broadcast

The Manager as Leader: A Program for Effective Leadership

Presented by Dr. Patrick Bettin

Members' Choice
Thursday, November 16, 1989
Friday, November 17, 1989
11:00 AM - 5:00 PM Eastern Time
Channel B

Dr. Patrick Bettin
is a senior scientist with Battelle, where his research focuses on the achievement of organizational effectiveness through development of leaders and managers.

Learn how to identify personal strengths and weaknesses as a leader, develop an action plan and become an effective motivator.

Audience: This course was created expressly for middle-level managers. However, anyone in a position of some authority will benefit from the program.

(See other side for course description)

Sponsored by: Battelle Seminars Program

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Course Code:
MC891116B1

The Manager as Leader: A Program for Effective Leadership

Thursday, November 16, 1989
Friday, November 17, 1989
11:00 AM - 5:00 PM Eastern Time

Course Objectives

You will learn how to identify personal strengths and weaknesses as a leader by understanding the basic principles of leadership. You will be able to develop an action plan for improving inherent leadership skills, and you should become effective motivators and decision-makers who can make an immediate, positive impact on the success of their organizations. You will explore leadership, communication and motivation theories and then learn how to relate several proven principles to specific talents.

Course Description

The seminar includes the following topics: The nature of leadership, the leader as change agent, creating the vision, developing the team, clarifying the values, positioning, communicating, empowering, coaching and measuring.

Audience

This seminar was created expressly for middle-level managers — that broad range of professionals above first-level supervisor and below director-level. Nonetheless, anyone in a position of some authority in any organization will benefit from this program.

Course Materials

One set of course notes will be sent to all registered sites to be reproduced for each participant.

In addition, a textbook, *The Leader-Manager: Guidelines for Action*, by Dr. Bill Hitt, is highly recommended. It can be ordered for $24.50 plus $3.50 postage and handling from Battelle Seminars Program, 4000 N.E. 41st Street, Seattle, WA 98105, or by calling 1-800-426-6762. Call for quantity discount information.

Live Satellite Broadcast

Cross-Functional Management

Presented by Charles E. Hutchinson, Joseph F. Kasper, Dan Dimancescu, James F. Watson, Thomas G. Gunn, J. Tracy O'Rourke, Robert I. Winner, Robert Johansen, Gerald A. Paxton and Peter Turney

Monthly Feature
Tuesday, November 14, 1989
11 AM - 5 PM Eastern Time
Wednesday, November 15, 1989
11 AM - 3 PM Eastern Time
Channel B

Cross-functional management is the "heart" of good engineering. This two-day program will capture and update material from a series of workshops offered by the Thayer School of Engineering at Dartmouth College.

Senior engineering managers and executives will present practical material from various industries, as well as techniques to control and improve quality and new management tools that can influence product quality.

This course will benefit practicing engineers and engineering managers interested in product design, development and manufacturing.

(See other side for course description)

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Charles E. Hutchinson
is dean of the Thayer School of Engineering at Dartmouth College.

Joseph F. Kasper
is associate director of the Cook Engineering Design Center at the Thayer School of Engineering and adjunct professor.

Dan Dimancescu
is the founder of Technology and Strategy Group, a science and technology management consulting firm.

James F. Watson
is vice president of Texas Instruments Inc.

Thomas G. Gunn
owns a consulting firm, Gunn Associates Inc.

J. Tracy O'Rourke
is president and chief executive officer of the Allen-Bradley Co.

Robert I. Winner
is a senior research staff member of the Computer Software Engineering Division of the Institute for Defense Analyses (IDA).

Robert Johansen
is director of the Institute for the Future's New Technologies Program.

Gerald A. Paxton
is vice president of U.S. Sales for Digital Equipment Corp.

Peter Turney
is Tektronix Professor of Cost Management at Portland State University.

Course Code:
MF891114B1

Cross-Functional Management

Tuesday, November 14, 1989
11 AM - 5 PM Eastern Time
Wednesday, November 15, 1989
11 AM - 3 PM Eastern Time

Course Objectives

This two-day program will cover:

- Introduction to the concept of cross-functional management and its relation to current engineering management practice
- Review of quality control and quality improvement experiences in several industries
- Identification of of new tools, techniques and technologies required to implement cross-functional management
- Comparison of civilian sector and defense-industry approaches to quality control and management
- Discussion of new organizational structures, centered on quality and productivity improvement

Course Description

The Thayer School of Engineering at Dartmouth College has organized a series of workshops dealing with cross-functional management — the "heart" of what might be termed good engineering. This two-day course will capture and update the key material from these workshops.

Quality and competitiveness are receiving increased attention from engineers and engineering managers. Cross-functional management tools and techniques can help. They offer a way of improving enterprise integration, product development, quality, cost and cycle-time performance.

Cross-functional management brings forth designs that are based on customer needs, as well as manufacturing/production solutions that are closely coordinated with front-end design concepts.

In this program, senior engineering managers and executives will present practical material from the automotive, defense, electronics, computer and electrical equipment industries. The material will cover techniques to control and improve quality. It also will cover new organizational structures and management tools needed to influence product and process quality.

Intended Audience

Practicing engineers and engineering managers with an interest in product design, development and manufacturing will benefit from this course, as well as engineering managers faced with the need to understand, control and improve quality in their products and processes.

Course Materials

One set of course notes will be sent to each registered site to be reproduced for each participant. In addition, the following books and articles are recommended reading:

- Thomas Gunn, *Manufacturing for Competitive Advantage* (Ballinger, Cambridge, Mass., 1987)
- Peter Turney and Bruce Anderson, "Accounting for Continuous Improvement," *Sloan Management Review*, Winter 1989.
- Bernard Avishai, "A CEO's Common Sense of CIM: An Interview with J. Tracy O'Rourke," *Harvard Business Review*, January-February 1989.
- Robert Johansen et al., *Groupware: Computer Support for Business Teams* (Free Press, New York, 1988)
- Masaaki Imai, *Kaizen: The Key to Japan's Competitive Success* (Random House, New York, 1988)

Live Satellite Broadcast

Engineering Use of Adhesives

Presented by Dr. Gerald Schneberger

Monday, November 13, 1989
11:00 AM - 5:00 PM Eastern Time
Channel B

Dr. Gerald Schneberger is the founder and president of Training Resources Inc. He has authored dozens of papers and books in the field of industrial bonding and painting. He edited the reference book, *Manufacturing with Adhesives*, in 1986.

This practical course will explore the advantages and limitations of using adhesives to improve product performance and company profits.

No chemical background is needed.

Audience: Design and manufacturing persons and their managers, as well as lab technicians and quality control, liability and field service personnel.

(See other side for course description)

Sponsored by: GMI Engineering & Management Institute

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Course Code:
MC891113B1

Engineering Use of Adhesives

Monday, November 13, 1989
11:00 AM - 5:00 PM Eastern Time

Course Objectives

This is a practical course designed to acquaint designers and manufacturing people with the advantages and limitations of using adhesives to improve product performance and company profits. No chemical background is needed.

Course Description

This program will:

- Explain the advantages and limitations of adhesives.
- Describe the nature of surfaces and illustrate the role of surface energy in bond formation.
- Review the characteristics of major adhesive types.
- Summarize joint design fundamentals.
- Explain the importance of surface preparation and review important cleaning and conversion methods.
- Present the pros and cons of adhesive application methods.
- Explain important adhesive test methods.
- Provide guidelines for choosing an adhesive.

Course Content

Session 1 — Adhesives: What, why and how.
Session 2 — Polymeric and adhesive concepts: Polymers, wetting, strength versus molecular structure, transition temperature, polymer activity and adhesive curing.
Session 3 — Adhesive characteristics: Epoxies, acrylics, urethanes, polyamides, phenolics, cyanoacrylates, anaerobics, silicones, hot melts, pressure sensitives, UV cured, two-part.
Session 4 — Surface preparation for bonding: Nature of surfaces, solvent and acqueous cleaning, conversion of steel, aluminum and plastic surfaces.
Session 5 — Joint design fundamentals: Types of joint stresses, stress distribution and design rules.
Session 6 — Adhesive application processes: Extrusion, spray, roll, manual, automatic and robotic.
Session 7 — Adhesive testing: Top shear, tensile, cleavage, peel and tack.
Session 8 — Choosing an adhesive: Ten practical tips.

Live Satellite Broadcast

Intelligent Robotics and Manufacturing

Presented by Dr. Shimon Y. Nof, Dr. Colin L. Moodie and
Dr. J.M.A. Tanchoco

Wednesday, November 1, 1989
11:00 AM - 5:00 PM Eastern Time
Channel A

Learn about the field of robotics, including industrial robotics, intelligent transporters, and advanced automated guided vehicles.

A review of recent developments and research results in intelligent robotics and manufacturing, a discussion and evaluation of emerging techniques, implementation, and benefits to industrial applications.

The material presented in this seminar will be appropriate for engineers and managers concerned with justifying and implementing intelligent robotics and manufacturing technologies in their factories.

(See other side for course description)

Sponsored by: Purdue University

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Shimon Y. Nof
Dr. Nof is professor of industrial engineering at Purdue University.

Colin L. Moodie
Dr. Moodie is professor of industrial engineering at Purdue University.

Jose M.A. Tanchoco
Dr. Tanchoco is professor of industrial engineering at Purdue University.

Course Code:
MC891101A1

BEST COPY AVAILABLE

Live Satellite Broadcast

Vendor Certification

Presented by Mark L. Crossley

Members' Choice
Friday, October 27, 1989
11:00 AM - 5:00 PM Eastern Time
Channel A

Mark L. Crossley
President and principal consultant of Quality Management Associates Inc., of Salisbury, N.C., Mr. Crossley has over 20 years' experience in quality engineering and management. He is certified by the American Society for Quality Control (ASQC) as a certified quality engineer and a certified reliability engineer. He has served on the national certification board of the ASQC. Mr. Crossley has a bachelor's degree in chemistry and is a member of the American Statistical Association and the American Mensa Society.

How to establish an effective vendor certification program

Vendor certification will enhance communications between buyer and supplier, reduce barriers, and, most importantly, help ensure consistent quality goods.

This workshop is designed to review aspects of the vendor (supplier) certification process.

Intended audience: Technical people, including reliability engineers and certified quality engineers, and others interested in the supply process in plants.

(See other side for course description)

Sponsored by: University of Kentucky

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Course Code:
MC891027A1

BEST COPY AVAILABLE

Vendor Certification

October 27, 1989
11:00 AM - 5:00 PM Eastern Time

Course Description

As a prerequisite to maintaining and expanding your customer base, it is imperative that superior quality of goods and services be provided. One important way is to establish an effective vendor certification program. Vendor certification will enhance communications, reduce barriers between buyers and suppliers, and help ensure consistent quality goods.

This workshop is designed to review various aspects of the vendor (supplier) certification process. Specific areas to be addressed are:

- Supplier Improvement Strategy
  Management commitment, supplier improvement, specification development, supplier measurements and supplier awareness.
- Supplier Survey
  Review of general requirements of a quality program (ANSI/ASQC), TQM, Mil-stds.
- Vendor Rating Systems
  Objectives of a rating system and examples of rating systems.
- Supplier Quality Audits and Surveys
  Benefits of vendor surveys, psychological factors of an audit, key steps in conducting the audit and development of the audit check list.
- Supplier Certification
  A review of several certification formats: Ford Motor Co., Rockwell International, Roper Corp., and General Tire.
- Current reference and books.

Live Satellite Broadcast

Manufacturing International '88 Conference — Highlights and Benefits to Industry

Members' Choice
Wednesday, October 25, 1989
11:00 AM - 5:00 PM Eastern Time
Channel A

In April 1988, more than 350 U.S. and foreign engineers and managers met in Atlanta for the MI (Manufacturing International) '88 Conference. The purpose: "to bring a broad perspective of manufacturing problems to the audience."

How much has changed in a year and a half? Have there been new developments? How has technology changed? Find out October 25 when the MI '88 presenters return "to the stage" to give updated executive summaries.

A live discussion will follow with audiences at NTU sites across the country.

(Please see description on reverse side)

Sponsored by: American Society of Mechanical Engineers and National Technological University

---

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

The topics:

- Computers in Manufacturing
- Production
- Examples of Manufacture
- Local and International Opportunities
- General Live Discussion
- Preview of Future ASME Programs

The speakers:

- **P. Andrews**
  Deloit, Haskins & Sells
- **J. Black**
  Auburn University
- **R. Bohn**
  Harvard Business School
- **J. D. Goldhar**
  Illinois Institute of Technology
- **T. G. Gutowski**
  Massachusetts Institute of Technology
- **R. Jaikumar**
  Harvard Business School
- **Albert Jones**
  National Bureau of Standards
- **D. Koenig**
  Steinway and Sons
- **James A. Mason Jr.**
  Xerox Corp.
- **Leon F. McGinnis**
  Georgia Institute of Technology
- **M. McRae**
  White Consolidated Industries
- **K. Mobley**
  Technology for Energy Center
- **W. Howard Oden**
  University of Bridgeport
- **Phillip Ostwald**
  University of Colorado
- **C. Poli**
  University of Massachusetts
- **A.J. Rothstein**
  AQUA/AGRI Energy Corp.
- **E. R. Sims**
  Ohio University
- **R.J. Snyder**
  Ford Aerospace
- **R. Stevenson**
  General Motors
- **V. Tipnis**
  Georgia Institute of Technology

Course Code:
MC891025A1

Manufacturing International '88 Conference — Highlights and Benefits to Industry

October 25, 1989
11:00 AM - 5:00 PM Eastern Time — Channel A

Working with NTU, AMSE has initiated a new satellite program for members unable to attend national ASME conferences and meetings. The program will give members access to the technical papers and information they might otherwise have missed.

The October 25 program, which is directed toward manufacturing, will be the first. It is hoped that four live satellite broadcasts will be held each year on various subjects such as superconductivity, plant maintenance, safety, economics, micro-manufacturing applications, and environmental engineering.

Agenda

Wednesday, October 25, 1989
11:00 AM - 5:00 PM Eastern Time

Moderators: *D.B. Coffin*, NTU
E. Hay, ASME

11:00 AM **Computers in Manufacturing**
Why CIM; Getting Started in CIM
— D. Koenig
Panel Members
P. Andrews
J. Black
M. McRae
V. Tipnis
CAD for Economic Manufacture
— C. Poli
Workstation for CAM - Example
— T. McGinnis
Total Manufacturing System Design - Example
— E.R. Sims
Integration Issues in the Factory of the Future - Example
— A. Jones

12:45 PM Lunch Break

1:15 PM **Production**
Production Management
— R. Bohn
Managing Performance Improvement
— R.J. Snyder
Manufacturing Managers - Needs for Change
— H. Oden and H. Versallo
Plant Maintenance for Zero Downtime
— Keith Mobley

2:15 PM Break

2:30 PM **Examples of Manufacture**
Sheet Metal Fabrication
— P.F. Ostwald
Stamping Dies
— R. Stevenson
Composites
— T. G. Gutowski
Design for Manufacturability
— J. Mason

3:30 PM Break

3:45 PM **Local and International Opportunities**
Technology Policy
— R. Jaikumar
Economic Justification for New Technology
— J.D. Goldhar
International Technology Marketing
— A.J. Rothstein

4:45 PM **General Live Discussion**
Preview of ASME Future Programs

Live Satellite Teleconferences

Quest for Quality: An NTU Special Series

Presented by Dr. Joseph M. Juran, William Eureka, John T. Burr, Davis Bothe, Tim Costello, David Travis, Phillip Ross, William F. Fechter, Jaine Carter and Diane Byrne

Tuesday, October 24, 1989
Tuesday, October 31, 1989
Tuesday, November 7, 1989
Tuesday, November 14, 1989
11:00 AM - 5:00 PM Eastern Time
Channel A

Quality. Better goods. Better services. More effective workers. More satisfied customers. Quality distingushes one business above another ... creates its reputation... makes it a winner in global competition

The quest for quality will be featured in a special series offered in conjunction with National Quality Month and the awarding of the Malcolm Baldrige National Quality Award.

(See other side for course description)

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

KEYNOTE SPEAKER

Dr. Joseph M. Juran, chairman emeritus of the Juran Institute, has since 1924 pursued a varied career in management as engineer, industrial executive, government administrator, university professor, impartial labor arbitrator, corporate director and management consultant.

His career has been marked by a search for the underlying principles common to all managerial activity — particularly in management for quality.

He is the author of 12 books and hundreds of published papers. A holder of degrees in engineering and law, Dr. Juran maintains an active schedule as author, international lecturer and consultant. Of the more than 30 honorary awards he has received from 12 countries, the most recent has been membership in the National Academy of Engineering and the Order of the Sacred Treasure awarded by the Emperor of Japan for "...the development of quality control in Japan and the facilitation of U.S. and Japanese friendship."

Course Code:
QS891024AC

Quest for Quality: An NTU Special Series

Who should participate:
Technical professionals and managers interested in improving the quality of their services and products, thereby improving the effectiveness and competitiveness of their organizations.

The program will feature the latest ideas and practices for quality improvement, as well as techniques that have proven useful in the workplace.

Series Agenda

Tuesday, October 24, 1989

11 AM - 1 PM	**Quality Improvement as A Business Strategy** Dr. Joseph Juran Juran Institute
1 - 3 PM	**Quality Improvement in Administration** William Eureka American Supplier Institute
3 - 5 PM	**Standards in Quality and the Malcolm Baldrige National Award** John T. Burr Rochester Institute of Technology, Center for Quality and Applied Statistics

Tuesday, October 31, 1989

11 AM - 1 PM	**Quality in Manufacturing: Let Your Process Do Your Talking** Davis Bothe International Quality Institute
1 - 3 PM	**Higher Quality/Lower Risk in R&D** Tim Costello General Motors Corporation
3 - 5 PM	**Six Sigma: TQC, American Style** William B. Smith Motorola, Inc.

Tuesday, November 7, 1989

11 AM - 1 PM	**Supplier Quality Improvement as a Purchasing Business Plan Strategy** David Travis Ford Motor Company
1 - 3 PM	**Engineering Quality into Product Design** Phillip Ross
3 - 5 PM	**Kaizen: An American Approach** William F. Fechter Kaizen Institute

Tuesday, November 14, 1989

11 AM - 1 PM	**Getting People to Commit to Quality** Dr. Jaine Carter Carter and Carter
1 - 5 PM	**Total Quality Management** Diane Byrne American Supplier Institute

Live Satellite Teleconferences

Quest for Quality: An NTU Special Series

Getting People to Commit to Quality

Presented by:
Dr. Jaine Carter, Moderator and Content Expert
Dr. James D. Carter, Co-Host
John K. Hadokowitz and Robert Picha, Special Guests

Tuesday, November 14, 1989
11:00 AM - 1:00 PM Eastern Time
Channel A

Quality is the lifeblood of most businesses and organizations, and every employee is responsible for it. Learn how to determine where your organization's quality actions need improvement, and what to include in a quality action-awareness program.

This program will address such critical issues as **quality** (where are you now, and where do you want to be?), **commitment** (is there a way to measure progress?), **people** (why do people provide or produce poor quality? How do we get commitment to quality standards?), and **results** (how to initiate a quality philosophy and awareness program).

Objectives:

- Identify the nature of quality behavior
- Explore the quality in ourselves and what we do
- Develop measurement specifications for quality
- Develop guidelines for achieving quality action
- Instill personal responsibility for quality action
- Gain commitment toward consistent quality action

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Jaine Carter, Ph.D.,

is an international management consultant, writer and program producer specializing in human behavior strategies. She has designed over 25 human resources development videoconference programs and is the author of many publications, the most recent being "Stay Out of Your Own Way."

James D. Carter, Ph.D.

is a human behavioral strategist, international lecturer and program facilitator. He is chairman of the board of Carter & Carter Enterprises Inc., of Naples, Fla., and serves on the faculty of the president's association of the American Management Association. Jaine and James Carter have their own weekly cable television series, "Lifeskills." Among their clients are IBM, Dow Corning, GE, Whirlpool, Motorola and Borg Warner.

John K. Hadokowitz is president of JTH Associates and a former manager at IBM, where he worked for over 20 years. He also has been a manager for the Field Quality Project Office. **Robert Picha** is president of PsychoGraphics and a former nuclear project director for the Atomic Energy Commission, National Laboratory System. He is the founder of the management consulting firm "Ideas at Work."

Course Code:
QS891114A1

Live Satellite Teleconference

Quest for Quality: An NTU Special Series

Total Quality Management

Presented by Diane Byrne

Tuesday, November 14, 1989
1:00 - 5:00 PM Eastern Time
Channel A

This program will cover important elements of total quality management (TQM), including:

- Policy management
- Quality function deployment
- Taguchi methods
- Statistical process control
- Concurrent engineering

Participants will learn how TQM can be accomplished by top management (using seven basic tools and four fundamental characteristics), middle management, engineers and the work force.

A diagnosis and plan for TQM development will be offered.

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Diane Byrne is vice president of program management for the American Supplier Institute. She formerly served as administrator of the Quality Institute and as a Taguchi specialist with the Eaton Corp. A recognized authority on quality engineering, Ms. Byrne holds a Taguchi Award for Promotion (1986) and shares an award with Shin Taguchi as co-author of "The Taguchi Approach to Parameter Design," the ASQC's designated Best Written Technical Paper for 1986.

Ms. Byrne is a regional councilor for the ASQC automotive division and a member of the American Statistical Association and the Mathematical Association.

She has a B.S. degree in mathematics from the University of Michigan-Dearborn and has done graduate work in statistics at the University of Michigan-Ann Arbor.

Course Code:
QS891114A2

Live Satellite Teleconference

Quest for Quality: An NTU Special Series

Supplier Quality Improvement as a Purchasing Business Plan Strategy

Presented by David Travis

Tuesday, November 7, 1989
11:00 AM - 1:00 PM Eastern Time
Channel A

The Ford Motor Company's goal to produce the highest quality level cars and trucks in the world will require strong support from its supply base of inside and outside suppliers.

The program will outline how Ford production purchasing has developed a business plan strategy to support that corporate goal of product quality. The program will provide insights into the major strategies of:

- Supply base management.
- New product program quality benchmarks for suppliers.
- Incoming quality program.
- Continuous process capability improvement on current parts.

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

David Travis is director of supplier quality improvement for Ford Motor Company's North American Automotive Operations Production Purchasing department.

Mr. Travis has worked in component plants from the time he was hired in 1957 as a Ford College Graduate Trainee at General Products Division — Material Control Department, up to division manager for PPD (Plastics Products Division).

He has also been a department manager of Material Control, a member of the 1965 Saline Plant launch team, plant manager of the Owosso, Mich., battery plant, quality control manager of the General Products Division, operations manager of the Industrial Engine & Turbine Division (Turbine Truck Engines), plant manager of the Transmission and Chassis Division - Sharonville, Ohio, and manufacturing operations manager of Ford Tractor Operations.

Course Code:
QS891107A1

Live Satellite Teleconference

Quest for Quality: An NTU Special Series

Engineering Quality into Product Design

Presented by Phillip Ross

Tuesday, November 7, 1989
1:00 - 3:00 PM Eastern Time
Channel A

This course will introduce several contemporary quality methods that are the cornerstone of a good system. The methods are interdependent and useful for consistently meeting customer requirements. At the end of the course, you will understand the basics of a quality system.

Mr. Ross will offer an implementation strategy and make recommendations for the greatest success.

Audience: Persons responsible for establishing product or process specifications.

Course Outline

- Introduction to contemporary quality methods
- Quality Function Deployment (QFD) overview
- Contemporary viewpoint of quality
- Implementation strategy

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Phillip Ross is a mechanical engineering graduate of General Motors Institute. Most of his career has been spent in product design/development in General Motors' automotive powertrain industry, first with the Allison Transmission Division, then with Saturn Corp. The most recent assignments include working in the quality systems group and the lost foam casting and machining module at Saturn.

Since 1982, Mr. Ross has accumulated over 1,000 hours of teaching time on statistical and quality methods. He has his own consulting firm, PJR Quality Consultants, and is the author of *Taguchi Techniques for Quality Engineering*. He is a member of SAE and the holder of three patents on transmission component designs.

Course Code:
QS891107A2

Live Satellite Teleconference

Quest for Quality: An NTU Special Series

Kaizen: An American Approach

Presented by William F. Fechter

Tuesday, November 7, 1989
3:00 - 5:00 PM Eastern Time
Channel A

This presentation will introduce participants to Kaizen and the specific tools for modern quality and productivity improvement.

Participants will:
Gain an appreciation of incremental improvement and standardization, and find out how both contribute to innovation. **Get a perspective** on the management of quality and how its components fit together to enhance the quality, cost and delivery of products. **Obtain first-hand knowledge** of what others are doing by hearing success stories of proven managerial techniques.

Course Outline

- History and overview of Kaizen Institute of America.
- Kaizen philosophy, concepts, systems and tools.
- Why success in the marketplace depends upon Kaizen.
- Management's role in implementing Kaizen.
- Process-oriented management strategies.
- Total system focus to improvement.
- Kaizen success stories.

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

William Fechter does consulting work for Kaizen and is currently working on his Ph.D. dissertation (a research study on JIT manufacturing) at Arizona State University.

Mr. Fechter has been technical training manager at Motorola Inc., and an assistant professor at the University of Nebraska and Indiana State University. He has 26 years of experience in manufacturing and manufacturing education. In 1988, he was a keynote speaker at the American Society for Training and Development technical conference, presenting "Technical Training in the Factory of the Future." He is writing a book on techniques for continuous improvement.

Mr. Fechter has a B.S. degree in industrial technology from Illinois State University and an M.S. degree from Southern Illinois University.

His premise is that service and industrial organizations must develop a mentality of continuous improvement toward exceeding customers' expectations, and that time will be the competitive factor as organizations approach the 21st century.

Course Code:
QS891107A3

Live Satellite Teleconference

Quest for Quality: An NTU Special Series

Quality in Manufacturing: Let Your Process Do Your Talking

Presented by Davis Bothe

Tuesday, October 31, 1989
11:00 AM - 1:00 PM Eastern Time
Channel A

A manufacturing environment's answer to a 30-year-old quest for solving chronic quality problems through the use of simple statistical approaches.

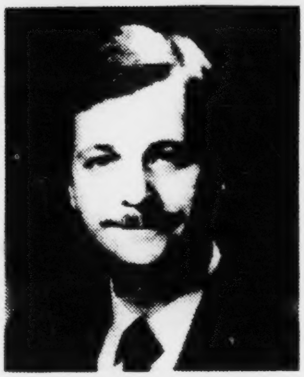
This program is designed to improve efficency and isolate the major sources of product variation, including:

- Knowing the difference between "chronic" and "sporadic" quality problems.
- Step-by-step procedures on how to implement this program.
- Actual case study presenting quality problems and their solutions.

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs



Davis Bothe is president of his own consulting firm, International Quality Control, Northville, Minn. He has a bachelor's degree in applied math and physics and an MBA degree, both from the University of Wisconsin-Milwaukee.

Mr. Bothe began his industrial career in 1973 as a systems analyst for NASA. In 1976 he joined General Motors as a statistician, and in 1979 he became a reliability engineer for a new engine development program. When the push for quality improvement took hold in the auto industry, he was put in charge of implementing the SPC program at one of GM's engine plants.

In 1985, Mr. Bothe started his own business. He also has been an adjunct professor of statistics at Eastern Michigan University. He has published numerous articles in *Quality* magazine, produced two videotapes on quality improvement, and written a training manual and two books. He is a senior member of ASQC, a certified reliability engineer and quality engineer, and a Cecil C. Craig award winner.

Course Code:
QS891031A1

Live Satellite Teleconference

Quest for Quality: An NTU Special Series

Higher Quality/Lower Risk in R&D

Presented by Tim Costello

Tuesday, October 31, 1989
1:00 - 3:00 PM Eastern Time
Channel A

In today's highly dynamic and competitive marketplace, it is no longer enough to design and develop products that work. Making products that function does not guarantee market success.

A proven edge for competitive advantage comes in the **early stages** of design.

This program will provide insight into innovative new ideas, including:

- Design modules which integrate many design tools into a single process.
- Application of the Concept Development Process (CDP)

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Tim Costello
is systems engineering manager of advanced vehicle engineering for General Motors' CPC Division, Pontiac, Mich. He is responsible for technology planning for future vehicle programs, and development of an advanced vehicle design process that will enable simultaneous improvements in quality, cost and timeliness to market.

Mr. Costello moved to the CPC Division on October 1 after working as staff engineer in charge of advanced methods activity at the AC Rochester Division of General Motors. The department researches, develops and implements advanced design methodology to improve the effectiveness of engineering activities. Design methods include: quality function deployment, Taguchi methods, designed experiments, and many more.

Mr. Costello has a degree in mechanical engineering from Cornell University.

Course Code:
QS891031A2

Live Satellite Teleconferences

Quest for Quality: An NTU Special Series

Six Sigma: TQC, American Style

Presented by William B. Smith

Tuesday, October 31, 1989
3:00 - 5:00 PM Eastern Time
Channel A

William B. Smith is senior quality assurance manager for Motorola's Communication Sector in Schaumburg, Ill.

He is a registered professional engineer in quality engineering and a Motorola Science Advisory Board associate. Mr. Smith has been awarded Motorola's CEO Quality Award for his work in relating product and process design margins to defects found in the manufacturing process and to the latent defects in shipped product which result in early life failures.

Motorola's fundamental objective is total customer satisfaction. This is achieved through two key factors: Six Sigma quality and Total Cycle Time reduction.

This program will take an in-depth look at participative management, the method Motorola employs to implement this process company-wide throughout the world.

The use of quality improvement tools has become pervasive. as more companies rely on a common quality metric as a normal business operation measurement.

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Course Code:
QS891024A3

Live Satellite Teleconference

Quest for Quality: An NTU Special Series

Quality Improvement in Administration

Presented by William Eureka

Tuesday, October 24, 1989
1:00 - 3:00 PM Eastern Time
Channel A

Most American quality-improvement efforts over the last decade have focused on product or manufacturing improvement. There are substantial (if not greater) opportunities for improving administrative and service operations.

This program will provide insights into how to improve the efficiency and effectiveness of business systems, including:

- Identifying customers and defining their needs
- Identifying and defining administrative processes
- Measuring the process
- Diagnosing, standardizing and simplifying

This program is directed to all managers, knowledge workers, and those engaged in administrative or service functions.

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

William Eureka is president of the American Supplier Institute. He has over 18 years of experience in automotive engineering and manufacturing at General Motors' CPC Division. He was instrumental in implementing Taguchi methods at GM, and his pioneering work in Quality Function Deployment (QFD) has made him one of American's experts in QFD.

Mr. Eureka is the author of *The Customer-Driven Company*, a landmark work on QFD published by the ASI Press. He recently completed "Quality Function Deployment and the Competitive Challenge," the first American video training series on QFD.

Mr. Eureka is a senior member of the ASCQ and a certified quality engineer. He has a B.S. degree in electrical engineering from the General Motors Institute, an M.S. in computer engineering from Case Western Reserve University, and an M.A. in management from Central Michigan University.

Course Code:
QS891024A2

Live Satellite Teleconference

Quest for Quality: An NTU Special Series

Standards in Quality and the Malcolm Baldrige Award

Presented by John T. Burr
Tuesday, October 24, 1989
3:00 - 5:00 PM Eastern Time
Channel A

The Malcolm Baldrige National Quality Award has raised the consciousness of U.S. manufacturers about effective quality systems. In the international sphere, the ISO900 series of standards has been developed, and by 1992, many U.S. companies wishing to be suppliers to European Common Market companies will be required to be registered as complying to one of the ISO9000 standards. For some companies, this is a reality today if they hope to continue to supply British manufacturing companies.

This talk will outline the five ISO9000 standards, the corresponding five Q90 standards, their use and comparison to other standards, and the Malcolm Baldrige National Quality Award. The status of the program in the United States to develop recognized registration agencies will also be discussed.

Participants will be able to:

- Understand and communicate the purpose and nature of standards in their company today.
- Evaluate their company's need for, and compliance with, the appropriate ISO9000 standard.
- Understand how to begin the process of developing a quality system and documentation for ISO9000 registration.
- Understand and communicate the benefits of registration for their company.

Sponsored by: NTU

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Dr. John T. Burr
recently joined the faculty of the Center for Quality and Applied Statistics, Rochester Institute of Technology, as an assistant professor. He had been a member of the adjunct faculty for four years.

In 1986, Dr. Burr retired from Eastman Kodak after 24 years in various posts: analytical chemist, production chemist for a polymer manufacturing department, quality consultant and trainer, and director of quality audits. On retiring, he founded Rochester Quality Associates, a quality consulting firm. He has conducted training programs at a number of firms and has spoken on quality technology, management and statistical topics to a variety of audiences.

Dr. Burr is a fellow of the American Society for Quality Control and vice president of the society's Publication Services. He is a certified quality engineer and a certified quality auditor. He has a Ph.D. in analytical chemistry from Purdue University.

Course Code:
QS891024A1

Live Satellite Broadcast

Practical Tools for Functional Managers

Presented by Dr. Melvin Silverman

Members' Choice
October 19 and 20, 1989
11:00 AM - 5:00 PM Eastern Time
Channel B

Corrected Poster!

The telephone number on the original poster was incorrect. When ordering extra textbooks from Purdue University, *please use the number on the back side of this poster.*

Technical managers quickly discover that the requirements for success are not the same as those for the engineer, scientist or technician.

Management is a difficult, dynamic art, not a science. There are no precise formulae because each organization is different. However, there are tested, pragmatic tools that can be adapted to fit a given situation.

This course will present the basic building blocks to use in developing your own successful management style.

Intended audience: Those who manage or intend to manage technical operations such as engineering, manufacturing, marketing, sales, quality, purchasing, R&D, and technical administration.

(See other side for course description)

Melvin Silverman
Dr. Silverman, Ph.D., P.E., is a managing partner with Atrium Associates of Cliffside Park, N.J.

Sponsored by: Purdue University

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Course Code:
MC891019B1

Practical Tools for Functional Managers

October 19 and 20, 1989
11:00 AM - 5:00 PM Eastern Time

Course Description

In two concentrated days, participants in this seminar will learn how to build their own success patterns.

Telephone access will permit interaction with Dr. Silverman throughout the seminar. Afterwards, additional questions can be submitted in writing, and answers will be provided by Dr. Silverman, either in writing or in a subsequent telephone conversation.

Course Objectives

At the conclusion of the seminar, participants will be able to:

- define technical management and explain how it is "different."
- identify methods for recruiting, training and evaluating technical staff.
- discuss delegation strategy and motivation.
- describe the different leadership styles of technical managers.
- explain the various aspects of communication, including written and verbal modes.

Course Materials

One copy of the seminar manual, which is an up-to-date compendium of articles, summaries and current supporting materials, will be sent to all registered sites to be reproduced for each participant.

The textbook, *The Technical Manager's Survival Book* (M. Silverman, McGraw-Hill, 1984), containing numerous case studies, is required; copies will be provided for the first six participants at a site. Additional copies are available at $45 each plus shipping and handling. To order, call Purdue University at (307) 494-7019.

Live Satellite Broadcast

Surface Contamination and Cleaning

Presented by Dr. Kashmiri L. Mittal

Members' Choice
October 10 and 11, 1989
11:00 AM - 5:00 PM Eastern Time
Channel B

Learn why surfaces get contaminated, how to clean them, and how to keep them clean.

The detrimental effects of surface contamination can be felt in many different technologies, including adhesion, composites, adsorption, tribology, soldering, device fabrication and printed circuit boards.

In the submicrometer geometries of microelectronics, a micrometer-sized particle could be disastrous. There is a definite need to understand why surfaces get contaminated and how to clean them and keep them clean.

Intended Audience: Anyone dealing with semiconductors, microelectronics or coatings, or technical professionals in the aerospace or biomedical fields.

(See other side for course description)

Sponsored by: National Technological University

For more information, contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Kashmiri Lal Mittal
Dr. Mittal is currently with IBM US Technical Education in Thornwood, N.Y. He received his B.S. degree from Panjab University, his M.Sc. in chemistry from the Indian Institute of Technology in New Delhi, and his Ph.D. in colloid chemistry from the University of Southern California.

Dr. Mittal has organized many international symposia and has edited 26 published books and others that are in the process of publication. He also is the editor of the series, *Treatise on Clean Surface Technology*, and has published about 60 papers on surface and colloid chemistry, adhesion and polymers. He is the editor of the *Journal of Adhesion Science and Technology*, which made its debut in 1987.

Guest Speakers
Dr. Madhav B. Ranade is a consultant in particle technology and an adjunct faculty member at the University of Maryland, College Park. **Dr. Timothy B. Vander Wood** is director of services at McCrone Associates, Norcross, Ga.

Course Code:
MC891010B1

Surface Contamination and Cleaning

October 10 and 11, 1989
11:00 AM - 5:00 PM Eastern Time

Day 1
Dr. Kashmiri L. Mittal

11:00 AM	Sources, Causes and Implications of Surface Contamination
Noon	Lunch Break
12:30 PM	Various Techniques for Cleaning Surfaces, Part I
1:25 PM	Break
1:35 PM	Various Techniques for Cleaning Surfaces, Part II
2:30 PM	Lunch Break
3:00 PM	Various Techniques for Characterizing Level of Cleanliness — Recontamination and Storage of Clean Parts, Part I
3:55 PM	Break
4:05 PM	Various Techniques for Characterizing Level of Cleanliness — Recontamination and Storage of Clean Parts, Part II

Day 2
Dr. Madhav Ranade

11:00 AM	Particle Adhesion and Removal, Part I
Noon	Lunch Break
12:30 PM	Particle Adhesion and Removal, Part II
1:25 PM	Break
1:35 PM	Particle Adhesion and Removal, Part III
2:30 PM	Lunch Break

Dr. Timothy Vander Wood

3:00 PM	Particle Detection, Analysis and Characterization on Surfaces, Part I
3:55 PM	Break
4:05 PM	Particle Detection, Analysis and Characterization on Surfaces, Part I

Live Satellite Broadcast

Indoor Air Quality

Presented By: James E. Woods, Jr., Thomas A. Bosman,
Charles A. Lane, Charles E. Dorgan

Members' Choice
Thursday - Friday, September 28-29, 1989
[illegible]:00 AM - 5:00 PM Eastern Time
(audio conference follows course)

A practical course for preventing, diagnosing and solving indoor air quality (IAQ) problems in buildings.

This seminar is intended for those who must prevent or solve indoor air quality problems. Professionals in the departments of facilities planning and management (both manufacturing and office space) will benefit. Specifically, product designers/engineers involved in air quality monitoring and control, plant engineers, facilities managers, architects, industrial hygienists, energy auditors or any other professionals who are involved in building and risk management. Upon completion of this course, participants will be able to:

- Use basic diagnostic procedures to identify causes of indoor air quality problems
- Propose modifications to existing building operations and HVAC systems to correct IAQ problems
- Select design alternatives that will result in acceptable IAQ and cost-effective operation

Please see course description on reverse side.

Sponsored By: University of Wisconsin - Madison

For more information contact your site coordinator or call NTU at (303) 484-0565

James E. Woods, Jr.
Senior Engineering Manager for Honeywell. He is responsible for the technical direction of Indoor Air Quality Diagnostics. He is the author of 80 technical papers and three books.

Thomas A. Bosman
Senior Environmental Hygienist for Honeywell Indoor Air Quality Diagnostics. He has been certified by the American Board of Industrial Hygiene since 1984.

Charles A. Lane
Principal Development Engineer for Honeywell Indoor Air Quality Diagnostics. Prior to joining Honeywell, he was a senior engineer and principal state planner at the Minnesota Pollution Control Agency, Air Quality Division.

Charles E. Dorgan
Professor in the Department of Engineering Professional Development and director of the Energy Technology Center of the University of Wisconsin - Madison.

Course Code:
MC890928B1

NTU
Advanced Technology & Management Programs

Indoor Air Quality

Members' Choice
Thursday-Friday, September 28-29, 1989
11:00 - 5:00 PM Eastern Time
(with a 45-minute audio conference following course)

This course will present the basics of indoor quality theory, control and diagnostic procedures in buildings. It will focus on enhancing your understanding of how building systems interact to affect indoor air quality.

We have reached the point where Indoor Air Quality can be controlled in the same way we control temperature, humidity, and lighting levels. Indoor air quality is important to energy, health, and productivity. The concepts covered in this course will improve the way we operate all buildings in the future.

In this course, emphasis will be placed on developing the skills to identify, recommend and implement changes in building systems to optimize energy management objectives while maintaining acceptable indoor air quality. Session topics are:

Introduction
- Historic perspective
- Basic concepts
  - -general definition
  - -stress, strain, susceptibility
  - -health and comfort
  - -ventilation

Indoor Air Contaminants
- Types of contaminants
- Sources of contaminants

Manifestations of Indoor Air Contaminants
- Human responses
- Economic impact

Indoor Air Quality Standards
- ASHRAE 62-1981
- ASHRAE 55-1981
- ANSI/ASHRAE 113P
- ASHRAE 129P
- HRSA 84-14.500

Building Design for Acceptable IAQ
- Principles of building performance
- Performance criteria for indoor air quality
- Indoor air quality diagnostics and performance evaluation
- Control and mitigation
- Measurement

Basic Contaminant Control Strategies
- HVAC systems and controls
- Psychometrics of HVAC systems
- Advanced IAQ control theory

IAQ Diagnostic Procedures
- Diagnostic protocol
- Use of IAQ diagnostics "worksheets"
- Use of instrumentation

Examination of Typical Cases

Live Satellite Broadcast

Simulation Analysis using SIMAN

Presented By:
Ronald F. Perry, Stewart V. Hoover

Members' Choice
Wednesday, Sept. 6, Friday's, Sept. 8 and 15, 1989
1:00 PM - 6:00 PM Eastern Time - **CHANNEL A**

This couse is intended for anyone wishing to solve real-world problems using discrete-even simulation analysis. Persons who could profit from this seminar include industrial engineers, manufacturing engineers, operations analysts and technical managers. Familiarity with elementary concepts of probability and statistics (e.g., relative and cumulative frequencies) is assumed.

Upon completion of this course participants should be able to construct and experiment with complex models of real systems to answer varied questions about the design and operation of such systems. Questions deal with systems such as: material handling systems, assembly lines, FMS cells, and inventory management. Specific issues would include: ACVS system layout, AS/RS configuration and operating policy, work station and buffer space design for production lines, and job shop scheduling.

Please see course description on reverse side.

Sponsored By: Northeastern University

For more information contact your site coordinator or call NTU at (303) 484-0565

Ronald F. Perry

Associate Professor of Industrial Engineering and Information Systems at Northeastern University. He is co-author of *Simulation: A Problem-Solving Approach*. His Ph.D. is in industrial engineering from the University of Michigan and his speciality is in management information systems. Dr. Perry has 15 years experience in simulation analysis.

Stewart V. Hoover

Engineer at Digital Equipment Corporation. He has been teaching and consulting in simulation analysis for over 15 years and is co-author of *Simulation: A Problem-Solving Approach*. His Ph.D. is in industrial engineering from the University of Oklahoma and his speciality is in simulation and operations research.

NTU
Advanced Technology & Management Programs

Course Code:
MC890906A1

Simulation Analysis Using SIMAN

Wednesday, Sept. 6
Friday's, Sept. 8 and 15, 1989
CHANNEL A
1:00 PM - 6:00 PM
Eastern Time

Course Description

The seminar will cover discrete-event modeling using the SIMAN simulation language. In SIMAN models are constructed from blocks, where each block represents some easily identifiable part of a real system; for example, QUEUE represents a queue for some process, and DELAY represents the passage of time such as machining a part. These blocks are readily assembled into a model of the real system which may then be simulated on the computer. The blocks are introduced in small groups and their use is explained with many illustrative problems. Models from diverse settings are used, such as health clinics, manufacturing cells, and material handling conveyors. An IBM PC will be used on camera to demonstrate the execution of many problems. Participants will have to opportunity to build and run models between sessions, and pose questions about their models. Session topics are:

Wednesday, September 6
Simulation Overview
Modelng and Simulation
Overview of Simulation Languages
Introduction to the SIMAN Language

Friday, September 8
SIMAN Basic Blocks
SIMAN Intermediate Blocks

Friday, September 15
SIMAN Advanced Blocks
SIMAN MAterial Handling Blocks
Output Analysis Using SIMAN

Live Satellite Broadcast

Manufacturing Simulation

Presented By: Neal P. Jeffries

Members' Choice
Thursday, August 31, 1989
11:00 AM - 5:00 PM Eastern Time

This course is an intensive overview of computer simulation of manufacturing operations. Included are considerations of benefits, limitations, applications, hardware and software options, costs, training requirements and upgrades. Session topics include:

- Why use simulation of manufacturing processes?
- Benefits:
  -Identifying bottlenecks
  -Determining throughput, manning requirements, number of machines, etc
  -Consideration of downtime, alternate arrangements , etc.
- Technical considerations
  -Hardware, uses of graphics etc
- Management considerations
  -Software and hardware costs and upgrade, training, appropriate applications, etc
- Software discussions and demonstrations

Sponsored By: University of Kentucky

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Neal P. Jeffries

Executive Director of the Center for Manufacturing Technology in Cincinnati, Ohio. Dr. Jeffries has extensive experience in computer applications in manufacturing.

Invited Guest Speakers

Mr. Van Norman
CEO
Auto Simulation, Inc.

Mr. John Hammond
Vice President
Systems Modeling Corp.

Mr. Robert Schwab
Senior Development Engineer
Caterpillar, Inc.

Mr. George Griffith
Manager
Simulation Services
EDS

Mr. Ken Tumay
Product Manager
CACI

Mr. David Godfrey
Manager
Belcan Automation

Course Code:
MC890831B1

Pre-taped satellite broadcast with live questions and answers

Application of Data Dependent Systems in Computer Aided Manufacturing and Design

Presented By: Sudhakar (Sam) M. Pandit

Members' Choice
Tuesday, August 29, 1989
11:00 AM - 5:00 PM Eastern Time

Data Dependent Systems (DDS) is a methodology for obtaining physically meaningful mathematical models in the form of differential/difference equations directly from observed data and then using the models for system analysis, prediction and control. Participants will have the opportunity to learn the concept, philosophy, and methodology of this novel and cost saving method. The DDS modeling procedure based on time series and least squares methods will be outlined, and model decomposition will be explained. A variety of typical applications will be discussed and illustrated. Applications include:

- Image processing in machine vision
- Microcomputer control of electro-discharge machining
- Characterization of machine-tool dynamics
- On-line tool wear monitoring
- Modal modeling and analysis

Sponsored By: Michigan Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Sam Pandit

has been involved in systems analysis, and forecasting and control since 1968, evolving the methodology called Data Dependent Systems. As a professor at Michigan Technological University, he has developed and taught both graduate and undergraduate courses on the topic and undertaken research in the application of this methodology in many different fields. These include: quality control, business forecasting, manufacturing processes, and solar energy simulation. Dr. Pandit has authored more than 90 papers and a textbook. He teaches two full length courses on Data Dependent Systems for the NTU Manufacturing Systems curriculum. In March 1989, Dr. Pandit presented the contents of this seminar for engineering employees at the General Motors Technical Center.

Course Code:
MC890829B1

Live Satellite Broadcast

Fundamentals of Industrial Ventilation Systems for Managers

Presented By: Salvatore R. DiNardi

Members' Choice
Friday, August 25, 1989
11:00 AM - 5:00 PM Eastern Time

This one day workshop is designed for managers who are responsible for the review or approval of ventilation system designs. The purpose of this course is to allow these managers to assimilate the knowledge needed to understand appropriate ventilation design techniques. Then, they will be able to make more informed decisions about selecting consultants and purchasing, installing, and maintaining ventilation systems. At the end of this workshop, managers will be able to:

- Determine where industrial exhaust ventilation is necessary
- Discuss the selection of appropriate collection hoods for dusts, gases and vapors
- Review the parameters for determining the most appropriate fan size, RPM, and static pressure
- Review case studies where these skills may be applied to a variety of situations including: dip tanks, soldering and welding stations, laboratory fume hoods, and bagging operations
- Conceptualize techniques for recognizing inefficient existing systems
- Acquire the techniques used to evaluate a ventilation design consultant before he or she is hired
- Critique ventilation design standards

Sponsored By: University of Massachussetts

For more information contact your site coordinator or call NTU at (303) 484-0565

Salvatore R. DiNardi

Associate Professor of Industrial Hygiene in the Division of Public Health, at the University of Massachusetts at Amherst. Dr. DiNardi designs and implements indoor air quality surveys to recognize, evaluate and control the sources of building related illness in the nonindustrial workplace. His experience with indoor air quality problems, especially epidemics of building related illness, has enabled him to provide solutions to these epidemics as well as to train and advise workers, supervisors and managers in many Fortune 500 companies as well as in smaller companies. He is on the Board of Directors of the Air Pollution Control Association and is a member of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE). He has published more than 40 articles on environmental health, industrial hygiene and chemistry.

Course Code:
MC890825B1

NTU
Advanced Technology & Management Programs

Live Satellite Broadcast

Project Management for the 90's

Presented By: Melvin Silverman

Members' Choice
Thursday-Friday, August 17 and 18, 1989
11:00 AM - 5:00 PM Eastern Time

Bring in your most challenging problems!

You will have the opportunity to solve specific management problems in a consulting, supportive matrix that will include all participants and be guided by the seminar director. This intensive seminar goes beyond basic methodology. It incorporates the effects of recent changes in the economic environment and delivers advanced systems and methodology that enable the project manager to optimize scarce behavioral, time, and financial resources. The seminar will include information about:

- Limitations on resources, people, funds, and time
- Lack of coordination within the project team
- Insufficient authority/unlimited responsibility
- Inaccurate or delayed information/confused inputs
- Why project management is the vital methodology for the 90's
- Differences between functions and projects
- The grand design of project systems
- Implementing project systems
- Personnel, finance, and operations
- Communications, behavior, and deliverables
- Problem solving and developing implementation plans

Sponsored By: Purdue University

For more information contact your site coordinator or call NTU at (303) 484-0565

Melvin Silverman

Managing partner of Atrium Associates, Inc., an international consulting organization based in Cliffside Park, NJ. Dr. Silverman has over 25 years of hands-on experience as an engineer, operations executive, and management consultant. He has been a plant engineer, project engineer, and general manager for companies producing complex, highly engineered products for industrial and defense users. Dr. Silverman is the author of numerous articles on project, technical, and general management topics. He has published several books, the most recent being *Project Management* and *The Technical Manager's Survival Book.*

Course Code:
MC890817B1

NTU
Advanced Technology & Management Programs

Live Satellite Broadcast

Statistical Process Control and Applied Statistics

Presented By: Mark L. Crossley, C.Q.E., C.R.E.

Members' Choice
Tuesday and Wednesday, August 15-16, 1989
11:00 AM - 5:00 PM Eastern Time

This seminar will present an introduction of basic statistics as applied to quality control. It will dramatically demonstrate the principles of sampling, its associated risk and statistical process control. Participants will gain first hand experience in the use and understanding of basic applied statistics through the use of spontaneously generated data that will simulate real work conditions. The program will also serve as an excellent review for the statistical portions of the American Society for Quality Control certified quality engineer (C.Q.E.) examinations. Topics covered will include:

- What is a statistic?
- Significance of the normal distribution
- Other important distributions including hypergeometric, binomial and poisson
- Acceptance sampling and the associated risk
- Statistical process control
- Process capability index
- Open discussion

Sponsored By: University of Kentucky

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Mark L. Crossley

President and Principal consultant of Quality Management Associates, Inc., of Salisbury, North Carolina. Mr. Crossley has a diversified background with over 20 years experience in quality engineering and management. He holds a B.S. degree in Chemistry and is certified as a quality engineer and reliability engineer by the American Society for Quality Control. His consulting assignments had taken him from Puerto Rico to Canada, and throughout the United States with industries ranging from aerospace, electronics, chemical manufacturing, pharmaceuticals and metal fabrication to food processing, textiles, printing, and injection molding. He is a member of the American MENSA organization and is listed in Who's Who of Industry and Finance.

Course Code:
MC890815B1

Videotaped broadcast with live questions and answers

The Art of Managing People

Presented By: Anthony Alessandra

Members' Choice
Wednesday, August 9, 1989
11:00 AM - 5:00 PM Eastern Time

This course will benefit anyone who manages people, especially supervisors and first-level to mid-level managers. Topics covered will include:

- 21st Century Management Techniques
  - Managing & motivating today's employee
  - Performance appraisals vs. appraising performance
- Understanding Your Management Style
  - Are you direct or indirect?
  - Are you task or relationship oriented?
- Flexing Your Management Style
  - How to "size up" your employees & co-workers
  - How to adapt your style to different employee needs
- Open Communications I
  - The power of listening
  - Questioning skills
- Open Communications II
  - Nonverbal communications
  - Mixed messages

Sponsored By: University of Southern California

For more information contact your site coordinator or call NTU at (303) 484-0565

Anthony Alessandra

A highly respected consultant in sales, marketing, and management, as well as an award-winning public speaker. He has written more than 100 articles and several books including *Non-Manipulative Selling*, *The Business of Selling*, and *the Art of Managing People*.

NTU
Advanced Technology & Management Programs

Course Code:
MC890809B1

Live Satellite Broadcast

The Write Design

Presented By: Tom Duncan

Members' Choice
Friday's, July 28, August 4 and 11, 1989
CHANNEL D
1:00 PM - 6:00 PM Eastern Time

Practical material and excellent instruction!

The Write Design cuts your writing time by teaching you how to organize your information effectively before you start writing. It combines the best narrative and structured writing techniques with the latest advances in instructional technology. You will learn how to use:

- Six tools to present your message clearly and concisely
- Four steps to ensure that your writing is presented objectively
- Four writing profiles to identify your reader
- Charts, tables, and graphs to illustrate your writing effectively
- A mathematical formula to grade the level of your writing

Sponsored By: University of Kentucky

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Tom Duncan

Senior technical editor in the GTE Telephone Operations Publications Group. He is one of the authors of *The Write Design* and has taught the course since it was piloted in 1983. Mr. Duncan brings nearly thirty years of writing and editing expertise to the classroom. He has served as a newswriter, advertising copywriter, newspaper editor, television news director, technical editor, and English teacher. He also brings the enthusiasm of a motivational speaker, keeping the class both interesting and challenging. He is a graduate of the U.S. Navy Journalist School and Wichita State University.

Intended Audience

This seminar is designed for any technical or business person who must write as a part of his or her job.

Course Code:
MC890728D1

Live Satellite Broadcast

Using Statistical Process Control for Quality Improvement: Concepts, Technologies and Systems

Presented By: Cyrus Mohebbi

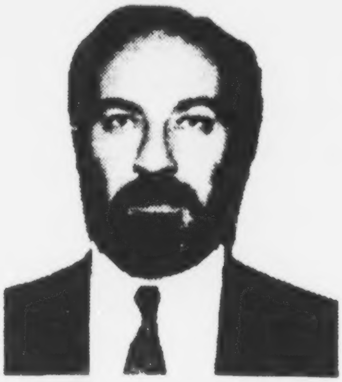
Members' Choice
Wednesday, August 2, 1989
11:00 AM - 5:00 PM Eastern Time

This course is intended for quality control supervisors, quality control managers, engineering supervisors, quality assurance managers and engineers, production supervisors, manufacturing engineers, general managers, and technicians. At the conclusion of this course, participants will:

- Be familiar with the basic tools and techniques associated with statistical quality control
- Understand how statistical quality tools may be applied
- Be able to use statistical quality control as part of a total quality management (TQM) system
- Be aware of the benefits derived from the appropriate application of statistical methods
- Identify areas for statistical quality control implementation that relate to the participants' work setting

Sponsored By: University of Southern California

For more information contact your site coordinator or call NTU at (303) 484-0565



Cyrus Mohebbi

Senior consultant with the Quality Alert Institute in New York City. He is a former faculty member of the Wharton School where he received several awards for teaching excellence including "Instructor of the Year" and "The Murray Prize for Excellence in the Teaching of Statistics." He has lectured and consulted extensively in the area of statistical quality control.

NTU
Advanced Technology & Management Programs

Course Code:
MC890802B1

Live Satellite Broadcast

Quality Engineering Using Robust Design

Presented By: Madhav S. Phadke

Members' Choice
Thursday and Friday, July 27 - 28, 1989
11:00 AM - 5:00 PM Eastern Time

Learn to:
recognize potential applications of robust design, formulate the problems, plan experiments, analyze data

In this course, participants will learn a new method called the Robust Design method, which is based on the Taguchi Method. It will focus on the actual engineering problems rather than on statistical theory. All engineering and statistical ideas will be described with the help of real case studies. Session topics include:

- Principles of quality engineering
- Matrix experiments using orthogonal arrays
- Steps in robust design
- Signal-to-noise ratios
- Achieving additivity
- Constructing orthogonal arrays
- Computer aided robust design
- Computer tuning
- Reliability improvement

Sponsored By: Polytechnic University

For more information contact your site coordinator or call NTU at (303) 484-0565

Madhav S. Phadke

An international leader in the Robust Design Method. He has applied this method to many engineering areas leading to millions of dollars of savings. The application areas include VLSI process design, circuit design, mechanical routing, component placement, computer tuning, and network design. Dr. Phadke has an M.S. in Statistics and Ph.D. in Mechanical Engineering from the University of Wisconsin - Madison. He is the author of the textbook that is required for this course entitled: *Quality Engineering using Robust Design*.

Course Code:
MC890727B1

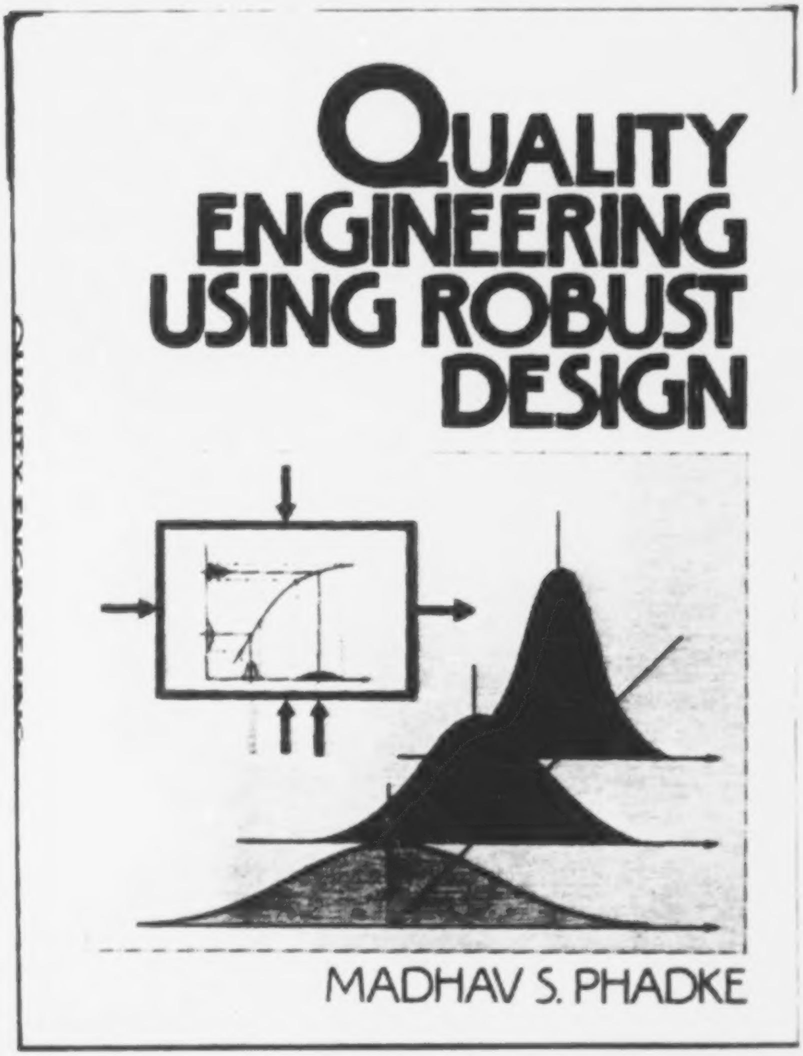
NTU
Advanced Technology & Management Programs

Live Satellite Broadcast

Quality Engineering Using Robust Design

Presented by: Madhav S. Phadke

Members' Choice
Thursday and Friday, July 27-28, 1989
11:00 AM - 5:00 PM Eastern Time



QUALITY ENGINEERING USING ROBUST DESIGN

MADHAV S. PHADKE

Required Text:
Quality Engineering Using Robust Design
by Madhav S. Phadke
(Prentice Hall, 1989).
ISBN # 01-3-745167-9.

To order:
Call the NTU
Order Desk at

Total Information
1-800-876-4636

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

NTU

Announces An
Executive Teleconference

Motorola's Process for Managing Quality and the Malcolm Baldrige Award

Malcolm Baldrige
National
Quality
Award

featuring
Robert W. Galvin
Chairman of the Board
Motorola Inc.

July 20, 1989
10:30 a.m. -12:30 p.m. Eastern Time
Live Satellite Broadcast via
KU and C Band

Mr. Galvin will share Motorola's strategies and, together with other senior Motorola executives, answer questions from participants at the teleconference receiving sites.

Contact National Technological University at (303) 498-0601 for technical information and program packet.

Live Satellite Broadcast

Communication Skills for Success

Presented By: Marla Bradley

Members' Choice
Wednesday, July 12, 1989
11:00 AM - 5:00 PM Eastern Time

Most managers spend up to 75% of their time communicating-

Learn to increase your communication skills

This course is designed to provide technical managers with the skills they need to communicate effectively with their subordinates, peers, and supervisors. Topics covered include:

- Introduction and Listening
- Improving your Listening Skills
- Direct Communications
- Feedback for Improved Performance
- The Communication Climate

Sponsored By: University of Southern California

For more information contact your site coordinator or call NTU at (303) 484-0565

Marla Bradley

President of the consulting company, Bradley-Lambert Management Specialists, which she founded following a corporate career in management. During the last nine years she has worked extensively with executive and management teams assisting them in the areas of communication, planning, and employee interactions.

Intended Audience:
This course is intended for managers in all technical or technical support organizations.

NTU
Advanced Technology & Management Programs

Course Code:
MC890712B1

The 1989 NTU Technical Professional Development Series

High Performance Workplace

Leadership, Teamwork and Quality

NTU

Advanced Technology and
Management Programs
P.O. Box 700, 601 South Howes St.
Fort Collins, Colorado 80522
(303) 484-0565

July to December 1989

**Live on the
NTU Satellite Network
11 a.m. to 1 p.m. (Eastern)
Every Monday**

High Performance Workplace

Leadership, Teamwork and Quality

Today's competitive markets demand a high level of performance from the technical professional— not mere compliance or obedience, but commitment, risk taking and creativity.

Clearly, there is no one path toward establishing a high performance workplace. However, what is fundamental in all successful work environments is a commitment to the people who produce and deliver products and services, as well as attention to the interactions between people within the organization.

This new TPDS is designed to bring about a greater awareness and understanding of the attitudes and skills necessary to enable the technical professional to be a leader and contribute to creating high performance, teamwork and quality in the workplace.

Calendar

July 1989 — Technical Professionals as Leaders: An Evolving Role

July 10	Context of Leadership
July 17	Leadership vs. Management
July 24	Success vs. Failure: Clarifying Values
July 31	Leadership: Facing the Challenge

August 1989 — Leadership Strategies: Becoming a Leader

August 7	Self-Esteem: Characteristic of Leadership
August 14	Creating Vision - The Job of Leadership
August 21	Communication - Tools of Leadership
August 28	Creating Trust - Role of Leadership

September 1989 — Leadership through Empowerment: Taking a Stand

September 11	Empowerment - The Process
September 18	Differences Between People - Recognizing the Value of Diversity
September 25	Teams: High Performance and Partnerships
October 2	Implementing Teams: Approaches, Challenges and Successes

October 1989 — Commitment vs. Control in the Workplace

October 9	Leader as Facilitator of Change and Results
October 16	Leader/Facilitator - Critical Skills
October 23	The Anatomy of Constructive Conflict
October 30	Who Wins, Who Loses?

November 1989 — Developing People - The Competitive Advantage

November 6	Leader/Manager as Developer of People
November 13	Negotiating: Success Strategies and Tactics
November 20	Creative Problem Solving
November 27	Rewards and Recognition

December 1989 — Getting Results: "The Bottom Line"

December 4	Creating Strategies from Vision
December 11	Planning Meetings for Results
December 18	Process Improvement for Total Quality

July 1989

The Technical Professional as Leader: An Evolving Role

July's four-part series will introduce the concept of leadership as an evolving role for technical professionals. The series will help you build a foundation for change by reviewing the evolution of traditional management theory. We will move from the past through the present to the future and will focus on the current business and global conditions that create a need for a shift from a management to a leadership perspective.

NTU

Advanced Technology and
Management Programs
P.O. Box 700, 601 South Howes St.
Fort Collins, Colorado 80522
(303) 484-0565

July 10

Context of Leadership

Subject matter person: Donna Vogel
Technical resource person: Gary Young

Director of Inspirit Development Inc., of Boulder, Colo., which specializes in organizational and leadership development, Ms. Vogel has a master's degree in psychology and combines experience as a psychotherapist with business. She has managed sales and operations in high-tech businesses for the past 12 years, including seven years with Control Data Corp.

Mr. Young is site manager at Hewlett-Packard's Colorado Integrated Circuit Division in Loveland. He holds MBA degrees in production and finance and bachelor's degrees in mechanical engineering and physics.

OBJECTIVES

- List changes in the evolution of management theory.
- List commonly accepted business attitudes and conditions prior to the 1960s, the 1960s through the present, and finally into the future.
- Relate management theory to worldwide business conditions of the past, present and future.
- Describe key elements contributing to a shift in business and industry from a management to a leadership perspective.

SESSION DESCRIPTION

This session will focus on understanding the evolution of the theory of management as a technical process. In the second hour of the program, Gary Young will share his ideas about the evolution of his own management/leadership philosophy over years of middle- and upper-management experience.

July 17

Leadership vs. Management

Subject matter person: Donna Vogel
Technical resource person: Keith Bartlett, HP-Fort Collins

OBJECTIVES

- List commonly accepted management characteristics.
- List commonly accepted leadership characteristics
- Differentiate between the characteristics of management and leadership.
- Describe the impact of change on traditional management models.

SESSION DESCRIPTION

This session will bring the information discussed in session one to a personal level. You will be able to evaluate and assess your own management and leadership styles. Using the Whole Brain model, you will be able to identify your personal strengths and weaknesses in dealing with people. We will explore personal characteristics that can lead to greater productivity and commitment in the workplace.

July 24

Success vs. Failure: Clarifying Values

Subject matter persons: Kenneth Adams and Kathy Kinchen
Technical resource person: Mark Oman, HP-Greeley

Mr. Adams has over 29 years of experience in the high-tech industry, including 20 years with Hewlett-Packard. He is an organizational development adviser at HP's Colorado Integrated Circuit Division.

Dr. Kinchen is an organizational development specialist at Colorado Integrated Circuit Division. She received her Ph.D. in industrial organizational psychology from Colorado State University. Her doctoral thesis was a ground-breaking study of what makes teams successful.

OBJECTIVES

- Given a list, differentiate between personal and organizational values.
- Given a corporate mission, list key steps for formulating team interaction values that nurture a team code of conduct.

SESSION DESCRIPTION

This session will explore the critical nature of values as a powerful determinant of behavior. With an understanding of values, the leader/manager works to foster an environment that creates high performance and results.

July 31

Leadership: Facing the Challenge

Subject matter person: Donna Vogel
Technical resource person: M.J. Kavcak, NCR-Systemedia

OBJECTIVES

- List commonly accepted characteristics of power.
- Describe alternative ways that power can be applied positively to get things done.
- Given current work environments, identify conditions that work against activities related to leadership.
- Given conditions that work against leadership activities, describe alternative approaches that technical professionals in leadership roles can apply.

SESSION DESCRIPTION

Stepping up to the role of leader is not something to be taken lightly. In today's competitive marketplace, sparked by rapid changes in people, technology and work, leaders are faced with many challenges. This session will explore the concepts of commitment, credibility and power as they relate to leadership behavior. We will unravel some of the misconceptions that exist about power and its use and misuse. Central to this discussion will be a focus on power as a fundamental concept in work relationships.

Donna Vogel

Gary Young

Kenneth Adams

Kathy Kinchen

Turn page to preview the August series...

August 1989

Leadership Strategies: Becoming a Leader

In the current review of leadership, four major themes have evolved, and four areas of competency have been identified. The August segment will focus on those strategies, with one underlying theme: leadership is a set of skills and attitudes that can be learned, developed and improved upon by anyone. The next four sessions will help you develop confidence in your potential as a leader. You will begin to develop your blueprint for success, whatever your role or position.

NTU

Advanced Technology and
Management Programs
P.O. Box 700, 601 South Howes St.
Fort Collins, Colorado 80522
(303) 484-0565

August 7

Self-Esteem - Characteristic of Leadership

Subject matter person: Donna Vogel
Technical resource person: Milt Szulinski, Kodak Colorado Division

Consultant to management at KCD in Windsor, Mr. Szulinski has 20 years of business-industrial experience. Since joining Kodak in 1976, he has held various engineering positions; in his current post he works with all of the concepts of total quality control, teamwork and performance management. He has degrees in mechanical engineering and business and is past chairman of the northern Colorado section of the American Society of Quality Control.

OBJECTIVES

- Describe the concept of self-esteem and its relationship to self-understanding.
- Describe the impact of personal beliefs and attitudes on the quality of decision making and interpersonal relationships.
- Describe the relationship of self-esteem to the effectiveness of leadership activities of technical professionals.

SESSION DESCRIPTION

Recognizing strengths, compensating for weaknesses — these are the first steps in achieving positive self-esteem. This session will focus on the art of openness to failure and to the quest for learning, so that you will embrace new ideas and new challenges. We will learn about the impact of this attitude on the immediate work team and the larger organization.

August 14

Creating Vision - The Job of Leadership

Subject matter persons: Kenneth Adams and Mac Juneau, HP-Fort Collins

OBJECTIVES

- List commonly accepted characteristics of vision.
- Describe the role of vision and its contribution to leadership and high-performance workplaces.
- Describe an approach to creating vision.

SESSION DESCRIPTION

Vision animates, inspires and transforms purpose into action! This session will explore the power of a shared purpose and its impact on the performance of work groups. Qualities that must be present in order for vision to create desire and motivate will be presented.

August 21

Communication - Tools of Leadership

Subject matter person: Vern Vobejda
Technical resource person: Lou Pagano, Kodak-Rochester

Before starting his own consulting firm, C-C-I (Creative Consultants Inc.), Mr. Vobejda spent 11 years at Procter & Gamble. C-C-I, founded in 1974 and based in Monument, Colo., provides organizational consulting services. The company also develops custom supervisory and management programs.

OBJECTIVES

- Describe how organizations function as a social entity.
- Describe critical communication skills:
  - attending behavior
  - open-ended questions
  - non-judgemental listening
  - expressing emphathy
  - "I" messages.
- List characteristics of communication that strengthen relationship building.

SESSION DESCRIPTION

This session will define the role of communication in developing effective leadership skills and show how organizations function as a social environment. You will practice creative communication and learn how communication helps create meaning in the work environment.

August 28

Creating Trust - Role of Leadership

Subject matter person: Vern Vobejda
Technical resource person: S.C. Kohli, Kodak-Rochester

OBJECTIVES

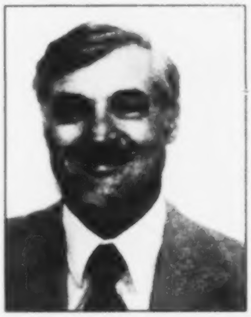
- Describe the characteristics of trust:
  - accountability
  - congruence
  - truth
  - harmony
  - accuracy
  - consistency.
- List "connectedness" principles.
- Relate the creative process with "connectedness" principles.
- Given rapid change and related uncertainty, describe how trust is tested and the value that results.

SESSION DESCRIPTION

This session will continue the exploration of communication as it develops effective, trusting teams. Trust is the lubrication that makes it possible for organizations to work. It implies accountability, predictability, reliability and an attitude of service. Elements necessary to build high trust will be presented, followed by an analysis of how these elements are affected by rapid change and periods of uncertainty.

BEST COPY AVAILABLE

Vern Vobejda



Milt Szulinski

> *You must not manage by rules or authority. That doesn't work with professional people.*
>
> **— Lou Pagano**
> Kodak, Rochester

Turn page to preview the September series...

September 1989

Leadership through Empowerment: Taking a Stand

> ***".....There is this place in people, where they are aligned, where they don't need to be told what to do; they more or less sort out for themselves what needs to be done and where they can work in harmony with other people, not as a function of a bunch of agreements or contracts, but out of a sense of harmony..."***
>
> ***Werner Erhard***

The September segment will explore this "alignment" as a manifestation of effective leadership. We will discuss the relationship of leadership to empowerment and define strategies for the empowerment of self and others.

NTU

Advanced Technology and
Management Programs
P.O. Box 700, 601 South Howes St.
Fort Collins, Colorado 80522
(303) 484-0565

September 11

Empowerment: The Process

Subject matter person: Donna Vogel
Technical resource person: Jim Pascucci, HP-Colorado Springs

OBJECTIVES

- List major characteristics of empowerment and describe the impact on people as it relates to performance.
- List qualities of empowering leadership.
- Describe commonly accepted beliefs and values underlying an empowering approach to leadership.
- List guidelines for effective empowerment.

SESSION DESCRIPTION

"To lead, One must follow"
—Lao Tzu

Leaders recognize that power and empowerment are two sides of the same coin, and that power becomes a unit of exchange. This session will focus on the concept of empowerment and the attitudes and behaviors leaders must demonstrate in order to create an environment that allows people to contribute to their fullest potential.

September 18

Differences between People - Recognizing the Value of Diversity

Subject matter persons: Anita L. Sanchez and Christopher (Kit) Tennis
Technical resource person: Michele Cooper, Pacific Bell-San Ramon

Dr. Sanchez and Dr. Tennis are the principals behind Sanchez, Tennis and Associates, a consulting group specializing in organization development. Dr. Sanchez has a Ph.D. in public administration and organization development from the University of Colorado, Denver. Dr. Tennis has a Ph.D. in business management and organization development from the University of Colorado, Boulder.

OBJECTIVES

- List reasons why people are different.
- Describe a conceptual framework for understanding differences in people.
- Describe several techniques which help build more satisfying and productive relationships.

SESSION DESCRIPTION

Increasingly, managers of America's corporations are faced with the challenge of leading individuals from diverse racial, ethnic, and gender backgrounds, whose values and behavior patterns may be unfamiliar. This program will help participants increase their self-awareness, deepen understanding of those who may be quite different from ourselves, and provide insights into how we can build more satisfying and productive relationships among all people.

September 25

Teams: High Performance and Partnership

Subject matter person: Susan Isgar

Susan Isgar consults on organization development, change, and team building. Her current area of focus is consultant training and development and executive education.

OBJECTIVES

- Describe the role of teams in organizational success as it relates to productivity, quality and rapid responsiveness to environmental changes.
- Differentiate between traditional teams and high-performing teams (HPTs).
- List and describe the skills needed to be effective, high-performing team leaders.

SESSION DESCRIPTION

High-performing teams are part of the cutting edge of management practice in the most successful and competitive companies throughout the world today. However, the switchover from a traditional organizational structure can be difficult unless individuals understand their changing roles and are comfortable in letting go of traditional controls. This session present guidelines for the supervisor or manager who is taking the initiative to implement transition from traditional teams to high-performing teams.

October 2

Implementing Teams - Approaches, Challenges, and Successes

Subject matter person: Kim Fisher

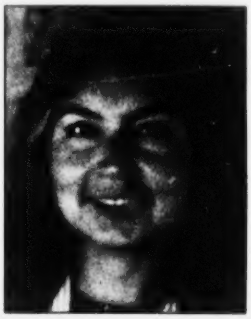
K. Kim Fisher is a principal with Belgard•Fisher•Rayner, Inc., of Federal Way, Wash., a consulting firm specializing in high-involvement training. He was a production manager in Procter & Gamble's innovative technician plant in Lima, Ohio, and has been an internal consultant at P&G and Tektronix. He has a master's degree in organizational behavior from Brigham Young University.

OBJECTIVES

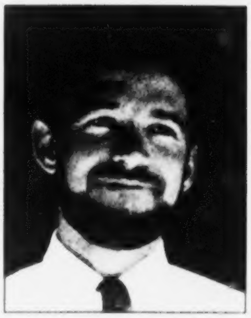
- Identify the principles of team-based management.
- Describe how these principles are applied in a technical environment.
- List the common challenges associated with these work systems
- Describe examples of successful implementations of these teams.

SESSION DESCRIPTION

A number of companies are involving engineers, researchers, technicians and other technologists in team-based organizations, and this course will review this trend. It will explore how high-involvement approaches, such as socio-technical systems, are applied in companies such as Tektronix, Exxon and Martin Marietta, and will review different approaches associated with the successful application of these work principles. It will also review the typical challenges of team-based management and illustrate how people work with the predictable difficulties of these organizations.

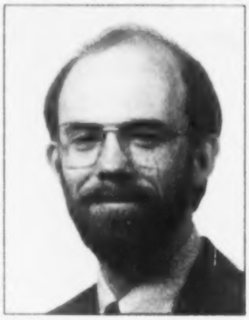


Anita Sanchez



Christopher Tennis

Susan Isgar



Kim Fisher

Turn page to preview the October series...

October 1989

Commitment vs.Control in the Workplace

October's four-part series will focus on how leaders must change their ways of thinking about people, work and the role of management to bring about commitment. They must regard people as resources to be developed and trusted. Work must be designed to engage the person's creative resources. Finally, the role of leader must shift from being a technical problem solver to being a facilitator who provides guidance and education.

NTU

Advanced Technology and
Management Programs
P.O. Box 700, 601 South Howes St.
Fort Collins, Colorado 80522
(303) 484-0565

October 9

Leader as Facilitator of Change and Results

Subject matter person: Kathy Kinchen
Technical resource person: Larry Flaherty, HP-Greeley

OBJECTIVES

- List commonly accepted barriers to change.
- List the characteristics of effective change agents.
- Identify and describe approaches in becoming an effective change agent in your work environment.

SESSION DESCRIPTION

Fundamental to this session is a belief that the key role for successful leaders will be that of changemasters— adept at reorienting their own activities and those of others in untried directions, bringing about higher levels of performance. The primary goal of this session is to help you understand the role of changemasters and how to help others work constructively with change.

October 16

Leader/Facilitator - Critical Skills

Subject matter person: Donna Vogel
Technical resource person: Larry Carnes, Kodak-Rochester

OBJECTIVES

- Determine your listening style
- List and describe the impact of listening style on communication.
- Describe listening techniques that are critical to successful communication.
- Describe the role of listening in creating trust and solving problems.
- List characteristics of positive and negative listening patterns.

SESSION DESCRIPTION

Listening has been cited as the most critical leadership skill. Listening is fundamental to communication — the skill used the most but taught the least. This session will describe good listening and its role in communication. You will learn about the barriers to effective listening as well as practical techniques that can be applied to help you experience the power of listening.

October 23

The Anatomy of Constructive Conflict

Subject matter person: Elaine Yarbrough
Technical resource person: S.C. Kohli

Dr. Yarbrough is the principal resource of Yarbrough & Associates of Boulder, Colo., a consulting group, and serves as adjunct faculty in the conflict management program of the Department of Sociology at the University of Colorado. The author of two books, she has a Ph.D. in communication and human relations from the University of Kansas.

OBJECTIVES

- Define your attitudes toward conflict.
- Describe how attitudes about conflict affect your leadership.
- Describe the characteristics of communication styles necessary for constructive conflict.

SESSION DESCRIPTION

Conflict is inevitable. Constructively managed, conflict can unleash energy and creativity in the workplace. Conversely, when conflict is avoided or when aggression is used, problems become difficult to solve and aspirations hard to reach. This session explores attitudes that lead to constructive conflict. Further, it explains the range of communication styles needed for effective conflict management and the necessity of being flexible when engaged in a conflict.

October 30

Who Wins, Who Loses?

Subject matter person: Elaine Yarbrough

OBJECTIVES

- Describe techniques that can be used to recognize real issues in conflict.
- Describe an approach which balances power during a dispute and leads to agreements which enhance productivity and satisfaction.

SESSION DESCRIPTION

Conflicts often drain energy because they focus on surface issues rather than the real issues of a dispute, and because people often struggle for power rather than trying to solve problems. This presentation will illustrate skills for clarifying real issues, substantive as well as emotional. In addition, it provides strategies for balancing power in a conflict so that all individuals can be heard, leading to better agreements.

Elaine Yarbrough

> *You cannot be a leader if you are not willing to confront problems and conflict.*
>
> **— S.C. Kohli**
> Kodak, Rochester

Turn page to preview the November series...

November 1989

Developing People - The Competitive Advantage

The November series will be guided by the idea that there are no limits to the ability to contribute on the part of a properly selected, well-trained, appropriately supported and, above all, committed person. We are beginning to acknowledge that survival depends upon quality, flexibility and constant innovation, which, in turn, depends on people. This segment will focus on leader/managers as developers of people and the critical part they can play in creating competitive advantage through people.

NTU

Advanced Technology and
Management Programs
P.O. Box 700, 601 South Howes St.
Fort Collins, Colorado 80522
(303) 484-0565

November 6

Leader/Manager as Developer of People

Subject matter person: Herb Dreo
Technical resource person: Steve Henry, HP-Greeley

Mr. Dreo is president of DMC Inc., and has been a partner and senior consultant for The Consultancy Inc. — two Colorado-based international consulting firms offering management assistance to government, business and industry. An instructor at Front Range Community College for the past eight years, he has conducted over 50 training programs on team leadership, management, problem solving, communication and outplacement.

OBJECTIVES

- List the three skills of situational leadership theory.
- Describe four basic leadership styles.
- Identify techniques that can be used to modify your leadership style.

SESSION DESCRIPTION

Situational leadership begins with the premise that there is not one style of leadership that managers should adopt. Rather, there are four basic styles, each with its own subtleties, to be used based on the abilities and motivation of individuals, the complexity of the task and other situational factors. This session will explore those styles and help you understand how to apply them and contribute to the success of others.

November 13

Negotiating: Success Strategies and Tactics

Subject matter person: David Stiebel

Dr. Stiebel, based in Palo Alto, Calif., services business executives by confidentially resolving and preventing disputes between and within organizations. His guest columns have appeared in the Los Angeles Times and the Los Angeles Business Journal. Dr. Stiebel teaches management and negotiation at the University of California.

OBJECTIVES

- List negotiation strategies that are used to resolve difficult disputes.
- Describe techniques that can be applied to help you get what you want without damaging business or personal relationships.

SESSION DESCRIPTION

This session offers technical professionals proven negotiation strategies to resolve difficult disputes with employees, managers, or customers expeditiously and confidentially. Key benefits include saving time, achieving desired objectives and preserving working relationships.

November 20

Creative Problem Solving

Subject matter person: Vern Vobejda

OBJECTIVES

- Describe problem-solving techniques which use effective identification and resolution models.
- Describe new brainstorming and innovation techniques.
- Define principles of innovation as applied to the problem-solving process.
- List personal characteristics necessary for optimum use of creativity.
- Compare creativity applications found in many successful, innovative organizations.

SESSION DESCRIPTION

This presentation will discuss enhanced problem-solving skills, especially in the use of creativity, for dealing with change issues. Principles of innovation and creativity are meshed with problem definition, ownership and resolution techniques. Enhanced brainstorming techniques, barrier bashing, visual models, and hassle elimination will be reviewed. Personal characteristics that facilitate breakthrough solutions will also be reviewed as they relate to the "entrepreneuring" leadership style.

November 27

Rewards and Recognition

Subject matter person: Milt Szulinski
Technical resource person: Jim Patsey, Engineering Manager, Public Service Co. of Colorado

OBJECTIVES

- Describe commonly accepted beliefs and values about motivation and recognition.
- List and describe characteristics of successful recognition programs.
- Describe techniques and skills that provide an environment that reinforces performance and improvement.

SESSION DESCRIPTION

Information sharing, interaction and recognition are necessary to foster widespread involvement and commitment. This session will explore the ways — informally and formally — to celebrate the "small wins" that are indicative of solid, day-to-day performance turned in by more than 90 percent of the people in the workplace. You will recognize the connection between motivation and high performance and learn how to design recognition and reward systems that encourage individual contributions as well as teamwork.

Herb Dreo

David Stiebel

Turn page to preview the December series...

December 1989

Getting Results: "The Bottom Line"

Leadership is not leadership unless it produces results that have been achieved in an acceptable manner and are appropriate in the short and the long term. The December series will focus on the bottom line and on processes that, when implemented, will guarantee achievement, performance and improvement.

NTU

Advanced Technology and
Management Programs
P.O. Box 700, 601 South Howes St.
Fort Collins, Colorado 80522
(303) 484-0565

December 4

Creating Strategies from Vision

Subject matter person: Ken Adams
Technical resource person: Gene Zeller, R&D Manager, HP-Loveland

OBJECTIVES

- List major characteristics associated with strategy.
- Describe the relationship of vision to the development of long-range business strategies.

SESSION DESCRIPTION

This session will explore the process of identifying strategies to translate vision into reality. In general, an integrated strategy includes the *what*, the *why* and the *how*; vision reveals the *what* and *why* and strategies reveal the *how*, which tell us how to get there.

December 11

Planning Meetings for Results

Subject matter person: To be announced

OBJECTIVES

- Classify meetings according to desired outcome.
- Identify guidelines for effective meetings.
- Describe member and leader responsibilities in meetings.

SESSION DESCRIPTION

One reason why group meetings are ineffective is that leaders lack a coherent theory about meetings and the various functions they are meant to serve. Without guidelines, meetings can turn into endless discussions, with nothing accomplished. This session will define the different types of meetings, according to their function, and outline guidelines that will insure the effectiveness of meetings.

December 18

Process Improvement for Total Quality

Subject matter persons: Dan Harper and Joe Nesheim

OBJECTIVE

- List skills necessary to create an environment that fosters continuous improvement.
- Describe techniques that facilitate and maintain continuous improvement in your job and your organization.

SESSION DESCRIPTION

One of the questions often asked is, "How would I, as a technical professional, lead continuous improvement efforts?" This session will focus on techniques that can be used by management to improve skills and create an environment that fosters continuous improvement. A case study will be presented by a manager who used several of these techniques to improve the department's services and, as a result, its image.

Mr. Harper was one of the developers of the TQC (Total Quality Control) materials used to train managers throughout the Hewlett-Packard Co. As a senior TQC trainer/consultant at Hewlett-Packard in Loveland, he helps employees, suppliers and customers understand and apply TQC. He has been professionally involved in process improvement efforts at HP since 1974.

Mr. Nesheim is quality engineering manager at Hewlett-Packard in Loveland, where his department is responsible for studying and promoting new productivity enhancement methods on site. A former high school mathematics and physics teacher, he has a B.S. degree in mathematics and physics from Mankato State College in Minnesota and an M.S. degree in electrical engineering from the University of Colorado.

Dan Harper

Joe Nesheim

What is NTU?

National Technological University (NTU) is a private, nonprofit institution founded to serve the advanced needs of today's busy, highly-mobile engineers, scientists and technical managers.

NTU offers Masters' of Science Degrees in:

Computer Science
Computer Engineering
Electrical Engineering
Engineering Management
Manufacturing Systems Engineering
Material Science and Engineering
Management of Technology

NTU also offers non-credit short courses, seminars, and workshops on leading edge engineering and computer topics.

MEMBER UNIVERSITIES

Arizona State University
Boston University
Colorado State University
Georgia Institute of Technology
GMI Engr. & Mgt. Inst.
Illinois Institute of Technology
Iowa State University
Michigan Technological University
North Carolina State University
Northeastern University
Oklahoma State University
Purdue University
Southern Methodist University
University of Alaska
University of Arizona
University of Florida
University of Idaho
University of Kentucky
University of Maryland
University of Massachusetts
University of Minnesota
University of Missouri-Rolla
University of Notre Dame
University of South Carolina
University of Southern California
University of Washington
University of Wisconsin-Madison

What is the TPDS?

The NTU Technical Professional Development Series is the only interactive professional development broadcast produced solely for the community of technical professionals.

The series, in its second year, allows technical professionals to better interpret and integrate their actions with those of their organization and its environment.

Intended Audience

Engineers, technicians, clerical personnel, planners, scientists, programmers and others who find themselves in increasingly self-governing roles. This series offers 'organizational savvy' to those who are already technically competent.

To Register

Call your NTU Site Coordinator or the NTU Satellite Network office (303) 484-0565.

Due to unforeseeable circumstances, speakers and titles may change.

> *What technical professionals need in an educational program is not more technology but information about group dynamics, organizational theory and how to interrelate with others in the organization.*
>
> **— M. J. Kavcak**
> NRC, Systemedia

> *Attention to people minimizes conflict and increases productivity.*
>
> **— Steve Henry**
> Hewlett-Packard, Greeley

NTU

Advanced Technology and
Management Programs
P.O. Box 700, 601 South Howes St.
Fort Collins, Colorado 80522
(303) 484-0565

Live Satellite Broadcast

A Day With Dr. W. Edwards Deming

Members' Choice
Monday, June 12, 1989
11:00 AM - 4:00 PM Eastern Time

The New Economics of Industry and Government

The managment system that served North America well from 1920 to about 1958 has now brought U.S. industry close to a state of economic collapse. Japanese industry has taken the lead in numerous areas of technology, applied science, and innovation. Dr. Deming will address the following concerns:

- How can this economically catastrophic situation be reversed?
- What role has the merit system played in our decline and how can it be changed?
- How can international economic cooperation be achieved to make America an industrial leader again before it is to late?
- How can management accomplish the transformation that is required?

Sponsored By: George Washington University

For more information contact your site coordinator or call NTU at (303) 484-0565

BEST COPY AVAILABLE

NTU
Advanced Technology & Management Programs

W. Edwards Deming

Consultant in statistical studies for over 40 years, with experience worldwide in complex apparatus, industry, physical depreciation of utility plants, accounting, clinical and laboratory investigations, transportation, and traffic. His clients include railways, telephone companies, carriers of motor freight, manufacturing companies, hospitals, legal firms, government agencies, and research organizations. His work in Japan created a revolution in quality and economic production and in new principles of administration. Dr. Deming has received many honors and medals, plus eight honorory doctorates. He was elected to the National Academy of Engineering in 1983 and inducted into the Science and Engineering Hall of Fame in 1986.

Course Code:
MC890612B1

Live Satellite Broadcast

Managing Manufacturing Competitiveness:

Information Processing, Product Development and Product Renewal Strategies

Presented By:
Daniel Orne, Susan Sanderson, and Richard Leifer

Members' Choice
Friday, May 26, 1989
11:00 AM - 5:00 PM Eastern Time

Ensure your company's competitive advantage and retain profitability!

This seminar introduces concepts and skills that develop quick responses to technological changes. You will learn to integrate business strategy, manufacturing strategies, and choices in emerging technologies.

Is being first-to-market best for your corporate strategy? Hear a discussion of the pros and cons.

You will learn to evaluate new technologies in terms of organizational strategy and direction and use the results to your company's advantage. See how this kind of evaluation and planning can lead you to sensible technological choices aimed at achieving "fit".

Sponsored By: Rensselaer Polytechnic Institute

For more information contact your site coordinator or call NTU at (303) 484-0565

Dr. Daniel Orne
Assistant Professor, School of Management and the Interdisciplinary Department of Decision Sciences and Engineering Systems at RPI. His research interests are manufacturing policy for strategic business units, manufacturing contingency theory, corporate CIM strategies, and master planning for CIM.

Dr. Susan Sanderson
Associate Professor, School of Management, RPI. Her current research concerns the development of models for evaluating the costs of new product design, systems design and their implementation.

Dr. Richard Leifer
Associate Professor, School of Management and the Interdisciplinary Department of Decision Sciences and Engineering Systems at RPI. His current research interests involve the organizational impacts of information systems.

Intended Audience
This seminar is geared for mid- and senior-level decision makers in operations or manufacturing who are involved in planning.

Course Code:
MC890526B1

NTU
Advanced Technology & Management Programs

Tape Delayed Broadcast

Peter F. Drucker Management Seminar

Members' Choice
Wednesday, May 24, 1989
11:00 AM - 5:00 PM Eastern Time

This seminar will
focus on the following topics:

Session One

How to Keep Your Business Competitive

Why is "competitiveness" important and how do your measure it? Presentation also includes the "three pillars" of competitiveness - market standing, productivity, and innovation.

Session Two

The Entrepreneurial Boom: The First Ten Years - The Next Ten Years

High-tech companies and technological advances continue to dominate news headlines. However, the focus of attention is shifting toward businesses that find new services and products for existing markets and that create new uses for existing products and services.

Session Three

The World's Financial System in Transition

The stock market crash in October 1987 signaled both the maturity of the system that had existed and its impending transformation. It created concerns regarding the future roles of equity markets and equity investments, and raised questions about the roles and functions of the old national stock exchanges.

Sponsored By: George Washington University

For more information contact your site coordinator or call NTU at (303) 484-0565

Peter F. Drucker

Consultant in economic and business policy and in management organization. Since 1971, he has been Clarke Professor of Social Science and Management at Claremont Graduate School. Previously, he was Professor of Management at the Graduate Business School of New York University and was also Professor of Politics and Philosophy at Bennington College. He is a Fellow of the American Association for the Advancement of Science and the American Academy of Arts and Sciences, and former president of the Society for the History of Technology. He is the recipient of the Taylor Key of the Society for Advancement of Management, and numerous other awards. Dr. Drucker has written extensively on politics and economics. He is an editorial columnist for The Wall Street Journal and a frequent contributor to magazines.

Course Code:
MC890524B1

NTU
Advanced Technology & Management Programs

Live Satellite Broadcast

Concurrent Engineering of Product and Process: A New Challenge

Presented By: Chuck Olson, Don Tyler,
David Zarnow, Daniel Whitney

Member's Choice
Wednesday, May 3, 1989
12:00 NOON - 3:00 PM Eastern Time

Course Description:

Concurrent Engineering is more than a buzz word. It is a new way of developing a product. It is not just an engineering technique, but a whole new way of doing business. It means people working together from the beginning of the concept state to achieve market driven goals of quality, performance, cost reliability, and durability all for an acceptable profit and ROI.

This seminar provides a behind-the-scenes look at the highly successful utilization of Concurrent Engineering concepts in designing and implementing the Hewlett-Packard CRT Project, and the far reaching Hughes Virtual Factory proposal for its microelectronics circuits division.

A clear understanding will be given of the functions and people within an organization that need to be involved. Viewers will learn the steps to be taken and those to be avoided as Concurrent Engineering spreads throughout the industry.

Sponsored By: IEEE

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Chuck Olson
During his eleven years at Hewlett-Packard, Mr. Olson has contributed as a Production Engineer, Design Engineer, Process Engineering Manager, and R&D Project Manager. He is currently managing the design of HP personal computers.

Don Tyler
Recently retired after forty years at General Motors. Mr. Tyler was the manager of Advanced Manufacturing for the Allison Transmission division, which pioneered concepts that will be part of the new World Transmission when introduced in the Fall of 1990.

David Zarnow
Manages the Design System Department for the Microelectronics Circuits Division of Hughes Aircraft. Mr. Zarnow originated the "Virtual Factory" concept of concurrent engineering as a means of meeting Hughes's needs for rapid design turnaround and thorough design practice in developing state-of-the-art microelectronics.

Daniel Whitney
is in Robotics and Assembly Systems at the Charles Stark Draper Laboratory. His group's work includes developing new methods for assembly automation - and design of products for more effective production and life cycles performance. Dr. Whitney's other interests include advanced robot assembly systems, and economic analysis of automation.

Course Code:
IE890503B1

Live Satellite Broadcast

Forum on Global Change and Our Common Future

Presented By:
National Academy of Sciences, Smithsonian Institution,
American Association for the Advancement of Science,
Sigma Xi - The Scientific Research Society

Tropical deforestation, sea level rise, and climatic warming could drastically alter the quality of life for future generations.

Rapid changes in the global environment have captured the attention of scientists, policymakers, and citizens around the world.

This forum provides a global view of environmental issues and their implications for public policy from a scientific perspective.

Sigma Xi - The Scientific Research Society, with support from the Department of Energy, invite you to view the satellite broadcast from select portions of this Forum.

FREE - Please RSVP

For more information contact NTU at
(303) 484-0565 or call

NTU
Advanced Technology & Management Programs

Broadcast Schedule:

Tuesday
May 2nd, 7:15 pm-10:00 pm ET
Opening Address:
"Society's Stake in Global Change" (Tape Delayed)
presented by:
William Ruckelshaus
Browning-Ferris Industries

Keynote Address and
Franklin Lecture:
"Global Change and Our Common Future" (Live)
presented by:
Mme. Gro Harlem Brundtland
Prime Minister of Norway

Wednesday
May 3rd, 7:30 pm-10:00 pm ET
Summary Panel: (Live)
Moderator:
Thomas Malone
St. Joseph College
presented by:
Alan Hecht
National Oceanic and Atmospheric Administration
Rafael Herrera
Instituto Venezolano de Investigaciones Cientificas, Venezuela
John Holdren
University of California, Berkeley
Thomas Lovejoy
Smithsonian Institution
Stephen Schneider
National Center for Atmospheric Research
Anne Whyte
International Development Research Centre, Canada

Course Code: MC890502D1
Channel D

Live Satellite Broadcast

Creative Alliances: Strategies for Management of Technology Transfer and Product Innovation Discontinuities

Presented By: Donald D. Meyers, Frederick Betz,
Richie Herink, Richard A. Lucic

Members' Choice
Tuesday, May 2, 1989
1:30 PM - 4:30 PM, Eastern Time

Course Description:

Key leaders in technology management will introduce and discuss management issues and creative alliances that can improve handling discontinuities that can result in technology transfer.

International competition is forcing shorter new product development cycles. The developing strategies for technology management in this environment is resulting in creative strategic alliances. No longer is the "not-invented-here" syndrome tolerable. One of the more difficult areas of technology management is where there are discontinuities in the technology. Where there are discontinuities, difficulties result in transferring and assimilating the technology. These problems, in turn, will impact organizational structure, strategy, operation, and personnel. This panel will discuss mangement issues specific to technology discontinuities.

Sponsored By: University of Missouri - Rolla

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Donald D. Myers, Moderator, is Director of the Office of Research Services and Associate Professor of Engineering Management at the University of Missouri-Rolla.

Frederick Betz is Program Director, Engineering Research Centers Program, Division of Cross Disciplinary Research and Directorate for Engineering, National Science Foundation.

Richie Herink is Program Director, Technology Management Education, Corporate Education, IBM, USA.

Richard A. Lucic is Director, Technology Transfer, Semiconductor Research Corporation.

Intended Audience
This course is for managers, supervisors, and employees who are involved in the organizational structure and management of technology transfer.

Course Code:
MC890502B1

Live Satellite Broadcast

Manufacturing Competitiveness and Quality by Design

Presented By: Bart Huthwaite

Members' Choice
Tuesday, April 25, 1989
11:00 AM - 4:00 PM, Eastern Time

Course Description:

This fast moving program shows how "simultaneous engineering" teams can design world class quality products in half the time with as much as a 40% reduction in cost. Participants will have the unique opportunity to apply what they learn by actually re-designing a product during the live satellite broadcast. Topics covered include:

- how to "implode" component design functions to slash product cost by half
- how to "imbed" world class quality into product designs
- how to learn about the latest in manufacturing and materials technology by applying "Bart's Law"
- how to measure the cost competitiveness of your product designs in the sketch stage by using "tools" such a Predictive Cost Modeling and the Boothroyd Dewhurst design-for-assembly method

Sponsored By GMI Engineering & Management Institute

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Bart Huthwaite

is renowned as the "guru" of the design-for-manufacture quality movement. His work at Ford Motor Company has been called vital in the success of "Team Taurus" with savings already past the $1 billion mark. Motorola Inc., winner of the prestigious First Annual Malcolm Baldridge National Quality Award, is using his techniques to slash manufacturing costs and maintain its quality leadership. Huthwaite is director of the Institute for Competitive Design (ICD), founder of VSI Automation, a leading automated assembly system manufacturer, and President of Troy Engineering, a company specializing in cost effective design. He is also founder of the International Conference on Product Design for Manufacture and Assembly, and is the developer of Predictive Cost Modeling (PCM), a design-stage technique for estimating total life cycle costs.

Course Code:
MC890425B1

Live Satellite Broadcast

Making Tomorrow's Polymers:

Synthetic Techniques You Can Apply Today

Presented By: Joseph P. Kennedy,
H. James Harwood, Frank Harris, Roderic P. Quirk

Members' Choice
Friday, April 21, 1989
12:00 PM - 4:00 PM, Eastern Time

Course Description:

This course features four distinguished polymer scientists who reveal the state-of-the-science in Carbocationic Polymerization, Free Radical-Induced Polymerization, Linear Step-Growth Polymerization, and Anionic and Transition Metal Catalyzed Polymerization. Participants will learn:

- What's new in free radical initiated polymerization...and how to use these new opportunities in research
- The most important leads in the area of carbocationic polymerization (including five new block copolymers)
- The latest tricks of the trade in linear step-growth polymerization - the information NOT found in textbooks
- All about anionic and transition metal catalyzed polymerization - from the fundamentals to the future

Sponsored By: American Chemical Society/NTU

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Advanced Technology & Management Programs

Joseph P. Kennedy
Distinguished Professor of Polymer Science and Chemistry at The University of Akron. An award winning scientist, Dr. Kennedy is currently involved in ionic polymerizations. His main research interest is in the design of macromolecules.

H. James Harwood
Professor of Polymer Science and Chemistry, The University of Akron. Dr. Harwood is an expert in free radical polymerization chemistry, with an emphasis on the microstructures of copolymers by free radical copolymerization.

Frank Harris
Professor of Polymer Science at The University of Akron, as well as the Chairman of BTC Membranes Inc., a company that develops specialty membranes. Dr Harris' main research interests include step-growth polymerizations and controlled release technology.

Roderic P. Quirk
Professor of Polymer Science at The University of Akron. His research interests are in polymer synthesis using organometallic initiators and catalysts. Dr. Quirk has published more than 50 professional publications, and is the North American Editor of the British Polymer Journal.

Course Code:
MC890421B1

Live Satellite Broadcast

Japanese Advanced Sensor Technology

Presented By: Henry Guckel, Eugene Haller, Takeo Kanade, Wen Ko, G. L. (Laurie) Miller, Veljko Radeka

Members' Choice
Wednesday, April 19, 1989 - **CHANNEL D**
1:00 PM - 6:00 PM, Eastern Time

Course Description:

This course will encompass both an overview of the Japanese sensor industry, and technical presentations covering specific selected sensor activities in certain important areas. It will provide a broad picture of the current status of sensor work in Japan. The material is taken from an extensive report entitled "Advanced Sensors in Japan" that was prepared by the speakers (under the auspices of the National Science Foundation, the U.S. Department of Commerce and the Advanced Research Project Agency) during most of 1988.

The primary topic is a brief overview of the roles of Industry/University/Government and Trade Associations in the implementation of Japanese sensor activities. It will be followed by selected topics in six technical areas:

- Machine Vision
- Sensors for Electromagnetic Radiation
- Hamamatsu (an example of technological success)
- Sensors for Factory Automation and Robotics
- Micromechanical Sensors
- Gas/Ion/Biosensors

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Dr. Henry Guckel
Department of Electrical Computer Engineering,
University of Wisconsin

Dr. Eugene Haller
Lawrence Berkeley Laboratory, University of California at Berkeley

Dr. Takeo Kanade
Department of Computer Science, Carnegie Mellon University

Dr. Wen Ko
Electronics Design Center,
Case Western Reserve University

Dr. G.L. (Laurie) Miller
Head Robotics Principles,
Research, Bell Labs

Dr. Veljko Radeka
Department of Instrumentation,
Brookhaven National Laboratory

Course Code:
MC890419D1

NTU
Advanced Technology & Management Programs

Live Satellite Broadcast

Behavioral Flexibility:

Improving Your People Skills

Presented By: Nancy Hightshoe

Members' Choice
Friday, April 14, 1989
11:00 AM - 5:00 PM, Eastern Time

Course Description:

Throughout history people have attempted to explain the differences between individuals. Knowledge has advanced and today there are more than a dozen varied concepts on behavioral differences. *Behavioral Flexibility* is a practical way to apply all this research to day to day living to reduce tension and increase cooperation and compatibility among people in both professional and personal situations. This presentation and interactive workshop will help participants learn where they fall on a behavioral continuum, and demonstrates strategies used for identifying and dealing with behavior patterns. Session topics are:

- Background on the behavioral flexibility system
- Administering and scoring the Behavioral Styles Questionnaire
- Options for successfully dealing with behavior styles
- Commitment to action

Sponsored By: University of Missouri - Rolla

For more information contact your site coordinator or call NTU at (303) 484-0565

Nancy Hightshoe

is a dynamic and talented speaker. She brings to her programs years of experience as a business owner and corporate trainer as well as very personal experiences as a commissioned police officer, counselor to victim of serious crimes and corporate consultant. This background provides the basis for her programs on leadership, human relations, sales and personal safety training. She has Master's Degrees in Human Relations and in the Administration of Justice, as well as a Bachelor's Degree in Psychology. She is Principal of Nancy Hightshoe Seminars, Inc.

Course Code:
MC890414B1

NTU
Professional Development Programs

Free Program
funded by
THE NATIONAL SCIENCE FOUNDATIO

Live Satellite Broadcast

Needs, Possibilities and Guidelines for Advanced Manufacturing

Presented By: Prof. Dr. -Ing. H. J. Warnecke

Members' Choice
Monday, April 3, 1989
2:00 PM - 5:00 PM, Eastern Time

This briefing, sponsored by the National Science Foundation, will describe advanced/automated manufacturing applied research in Europe and how these technologies impact on the design tasks of engineers. It will last approximately two hours and will be followed by a 1-hour question and answer call in.

Conventional rules and experiences in manufacturing have become obsolete. It is necessary to rethink the situation. New philosophies are evolving. This presentation will show the way to efficient manufacturing via modern components like computer-controlled machine-tools, robots, automated vehicles, assembly stations with sensors including manufacturing systems and production enterprises based on cybernetic management thinking.

The impact of an individual on manufacturing continually grows in importance. The more progressive the technology, the more important the developer and operator. Thus, individuals involved with manufacturing must be aware of the new directions. This presentation provides an opportunity to increase your capabilities.

Sponsored By: Oklahoma State University

For more information contact your site coordinator or call NTU at (303) 484-0565

NTU
Professional Development Programs

Course Code:
MC890403B2

Hans Warnecke

is managing director of the Fraunhofer-Institute for Manufacturing Engineering and Automation (IPA) of the Fraunhofer-Organization for applied research at the University of Stuttgart. The institute employees 250 people including about 100 engineers. Main fields of research and development are CAD/CAM, technology transfer, ergonomics, manufacturing processes, flexible manufacturing systems, industrial robots, automation, quality control, and industrial management. He is absolutely the top European researcher in automated manufacturing and production. Professor Warnecke received his Mechanical Engineering degree at the Technical University of Braunschweig, Germany. He has authored 8 books and about 500 publications in the field of production, industrial engineering and automation.

NTU

Technology and Management Symposium:

Special Week of Programs - March 20-24, 1989

Topics and speakers scheduled for the
NTU Technology and Management Symposium: March 20-24, 1989.

Registration fee is $2450. More information and Posters on each topic are available by FAX request at 303/498-0501 or calling 303/498-0601.

Monday March 20	11-1	**Making Work Fun** - (David Abramis)
	1-3	**Signal Processing with Superconductive Circuits** (Theodore Van Duzer)
	3-5	**The Zero Sum Solution** - (Lester Thurow)
Tuesday March 21	11-1	**The Renewal Factor** - (Robert Waterman)
	1-5	**Data Networking:The Merging of Local Area and Wide Area Networks** - (Stuart Wecker)
Wednesday March 22	11-3	**Total Quality Management through Variability Reduction** - (William Eureka)
	3-5	**Why Do Managers Mismanage?** If we know what works, why aren't we using it? (James O'Toole)
Thursday March 23	11-1	**Biological and Artificial Neural Networks for Pattern Recognition** - (Steven Rogers)
	1-3	**Toward the Millenium:** 10 New Megatrends - (John Naisbitt)
	3-5	**Composite Materials: The Challenge of Manufacturing** (Charles L. Tucker III)
Friday March 24	11-1	**Masters of Persuasion** - (Ronald E. Bassett)
	1-5	**Integrity and Service Assurance for Embedded Systems in the Hostile World** (Howard Johnson)

January 3, 1989 *Due to unforeseeable circumstances, speakers and titles may change.*

Live Satellite Broadcast

Masters of Persuasion

Presented By: Ronald E. Bassett

NTU Technology and Management Symposium
Friday, March 24, 1989
11:00 AM-1:00 PM, Eastern Time

Course Description:

This program is about communicating to lead, negotiate, sell ideas and build personal power. Success in these activities is not accidental; it comes from the ability to persuade others to take action. In this fast moving program, Dr. Bassett presents the most important skills and beliefs of master persuaders which he has discovered in over 20 years of study. You will learn:

- how leaders listen and communicate to raise morale and commitment of those they seek to lead.
- how to build rapport when face to face with anyone under any circumstances.
- how to prepare, persist and practice to ask for anything in a negotiation and get it.
- how to build personal power through your own "invisible organization" of people who will voluntarily cut red tape, provide early warning, bend rules, and share solutions you need to achieve your mission.

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Ronald E. Bassett

dubbed "Dr. Magic" for his seminars which have broken participation records. He is a master teacher, dynamic speaker and leading consultant. Formerly a tenured Professor and Associate Dean of Communications at the University of Texas at Austin, he was honored with two awards for excellence in teaching. He has been cited by the U.S. Office of Education and named an Outstanding Young Man of America. He is the author of many articles and has international readership of his bi-monthly newsletter.

Live Satellite Broadcast

Integrity and Service Assurance for Embedded Systems in the Hostile World

Presented By: Howard L. Johnson

NTU Technology and Management Symposium
Friday, March 24, 1989
1:00 PM-5:00 PM, Eastern Time

Course Description:

This course addresses the security of integrity and service assurance in current and future uses of embedded computer systems in control of water, land, air, and space systems. It speculates on the hostile environment encountered in public and military use and addresses the reality of the threat as well as the relationship to sensitivity, reliability and survivability programs. Security in semiautonomous or completely autonomous systems is addressed, expanding on the formal concepts of computer security. Session titles are:

- The Threat Environment of the 1990's
- Security of Integrity and Service Assurance
- Autonomous and Semiautonomous Systems Operating in a Hostile Environment
- A Security Architecture Design Walkthrough

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Howard L. Johnson

is President of Information Intelligence Sciences, Inc., a consulting firm in Aurora, Colorado, that specializes in data system security and high performance computing. He has 28 years' experience in engineering of hardware and software systems, including satellite support, intelligence data processing, robot control and supercomputer applications. He is an adjunct faculty member and does research at Colorado State University, Colorado School of Mines, University of Colorado and Denver University.

NTU
Professional Development Programs

Live Satellite Broadcast

Biological and Artificial Neural Networks for Pattern Recognition

Presented By: Steven K. Rogers

NTU Technology and Management Symposium
Thursday, March 23, 1989
11:00 AM-1:00 PM, Eastern Time

Course Description:

This presentation is intended for people with some experience in signal processing who wish to explore developments in neural networks, and for researchers interested in pattern analysis for artificial perception tasks. The presentation will cover topics from the history of research into biological neural networks which are pertinent to current unsolved problems in artificial perception. Neural network approaches to problems in the following areas will also be covered:

- Speech Recognition
- Segmentation and subsequent identification of targets in cluttered images
- Novel sensor pattern recognition (recognition of objects in sensor views such as laser radars and synthetic aperture radars)

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Steven K. Rogers

is Associate Professor of Electrical and Computer Engineering at the Air Force Institute of Technology, Wright Patterson Air Force Base. He has been the technical director and chair for conferences in optical/electronic pattern recognition, artificial intelligence, multisensor fusion, and computer vision. He co-authored the book *Defense Applications of Pattern Recognition*, and has published over twenty papers on optical information processing and related fields. He received his Ph.D. from the University of Colorado in 1984.

NTU
Professional Development Programs

Live Satellite Broadcast

Toward the Millennium:
10 New Megatrends

Presented By: John Naisbitt

NTU Technology and Management Symposium
Thursday, March 23, 1989
1:00 PM-3:00 PM, Eastern Time

Course Description:

This program focuses on ten new megatrends that Naisbitt discusses in his forthcoming book, *Toward the Millennium: The Decade of the 1990's.* Topics include:

- Renaissance in arts and literature-
  our arts and museums
- The end of the welfare state and the death of socialism-
  governments in change
- English as the first truly universal language-
  the language of the information age
- Individualization and globalization of electronic media-
  anywhere in living color
- The move to worldwide free trade-
  one global market place

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

John Naisbitt

is the author of *Megatrends* and co-author of *Re-inventing the Corporation*. He is one of the most respected spokesmen on trends in the 1990's. In 30 years of business experience, he has been an executive with IBM and Eastman Kodak, as well as a successful entrepreneur. He holds five honorary doctorates in the humanities and has been a visiting fellow at Harvard University. In his lectures, John Naisbitt always provides the audience with a positive path to their future.

NTU
Professional Development Programs

Live Satellite Broadcast

Composite Materials: The Challenge of Manufacturing

Presented By: Charles L. Tucker III

NTU Technology and Management Symposium
Thursday, March 23, 1989
3:00 PM-5:00 PM, Eastern Time

Course Description:

Composite materials offer high strength and stiffness combined with light weight; their applications range from automotive parts to aerospace. Not only do composite materials demand new expertise from designers accustomed to dealing with metals, composite materials also pose new challenges to manufacturing engineers.

Following a brief review of composite materials and their uses, this presentation, which concerns fiber reinforced polymer-matrix composites, will focus on the problems of economically manufacturing high-quality parts from composite materials. The importance of mathematical modeling of processing operations, and the need for close coupling between design and manufacturing will also be emphasized.

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Charles L. Tucker III

is an Associate Professor in the Department of Mechanical and Industrial Engineering at the University of Illinois at Urbana-Champaign. He studied Mechanical Engineering at M.I.T., receiving the S.B., S.M., and Ph.D. degrees. Dr. Tucker's honors include the Everitt Award for Teaching Excellence, and the SME Outstanding Young Manufacturing Engineer Award. He is the author of more than thirty-five technical papers and book chapters, and is the editor of *Fundamentals of Computer Modeling for Polymer Processing.*

BEST COPY AVAILABLE

NTU
Professional Development Programs

Live Satellite Broadcast

Total Quality Management Through Variability Reduction

Presented By: William E. Eureka

NTU Technology and Management Symposium
Wednesday, March 22, 1989
11:00 AM-3:00 PM, Eastern Time

Course Description:

A new quality ethic is helping to shape the industrial United States of the 21st century. It is based on the reduction of variation in design, manufacturing, and assembly in order to achieve continuous improvement in product quality and cost. The tools of this new perspective have been integrated into a ***pragmatic, actionable*** system which delivers high product quality with ***simultaneous*** cost reduction. Topics covered in this seminar include:

- Evolution of Quality Thinking
- Process Capability
- Target Value Quality
- Reliability Improvement
- Taguchi Methods Theory
- Quality Function Deployment
- Taguchi Methods Case Study
- Policy Development
- "Putting It All Together"

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

William E. Eureka

is President of American Supplier Institute. He holds a BEE from GMI, an M.S. from Case Western Reserve University, and an M.A. in Management from Central Michigan University. He has over 18 years experience in automotive engineering and manufacturing at General Motors, CPC Division. Mr. Eureka is an instructor in techniques such as Quality Function Deployment and Taguchi Methods. He is a senior member of the ASQC and is a Certified Quality Engineer.

NTU
Professional Development Programs

Live Satellite Broadcast

Why Do Managers Mismanage?

If we know what works, why aren't we using it?

Presented By: James O'Toole

NTU Technology and Management Symposium
Wednesday, March 22, 1989
3:00 PM-5:00 PM, Eastern Time

Course Description:

We all know what good management is. **So why don't we all do what we all know ought to be done?** Here are seven possible explanations for why managers mismanage:

- Organizations are unavoidably tyrannical and inherently uncaring; their destinies are inevitably tragic.
- No matter what we say, we don't like change.
- We suffer from "Managerism" (that is, we just gotta be the "boss").
- We lack the courage to do the right thing.
- Our unstated operational assumptions are faulty (e.g., competition vs. cooperation).
- Rewards are all aimed to support mismanagement (from Wall Street to promotion time).
- Good Management is Hard Work.

Now, let's discuss....

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

James O'Toole

holds the University Associates' Chair of Management in the USC Graduate School of Business. O'Toole's research and writings have been in the areas of public policy analysis, futures research, government/corporate relations, corporate culture and human resources development. He is the author of the books, *Vanguard Management*, *Energy and Social Change*, and *Making America Work*, and has published over 65 articles. He received a Doctorate in Social Anthropology from Oxford University where he was a Rhodes Scholar.

Live Satellite Broadcast

The Renewal Factor

Presented By: Robert H. Waterman

NTU Technology and Management Symposium
Tuesday, March 21, 1989
11:00 AM-1:00 PM, Eastern Time

Course Description:

The Renewal Factor speaks to the challenge and the opportunity in uncertainty - how you manage when one of the things you know for sure is that change will occur in unpredictable ways. During this program you will learn:

- How to set directions - not strategy
- How to identify the really important issues and make sure they are at the surface
- How to increase capability by building skills to sustain competitive advantage
- How to meet crisis points by anticipating opportunities with "what-if" scenarios

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Robert H. Waterman

is author of the bestselling book, *Renewal Factor*. Waterman spent 21 years at McKinsey and Company, where he was a senior director. He was head of the firm's organization and effectiveness project, which was a research, development, and training effort aimed at advancing the skills of McKinsey consultants. This project sponsored the research that lead to the book, *In Search of Excellence*, which was co-authored with Tom Peters. Waterman is now founder and chief executive of Waterman and Company, Inc., a firm which engages in research and writing, consulting, and venture management.

Live Satellite Broadcast

Data Networking: The Merging of Local Area and Wide Area Networks

Presented By: Stuart Wecker

NTU Technology and Management Symposium
Tuesday, March 21, 1989
1:00 AM-5:00 PM, Eastern Time

Course Description:

The late 1980's are seeing the beginnings of the merging of the two topologies which have driven data networking technology over the last two decades. In the early 1970's data network issues focused around the interconnection of remote terminals to host timesharing systems. The requirements and available transmission facilities led to the development of the concepts of statistical multiplexing and packet switching over wide geographic areas, the Wide Area Network (WAN). The early 1980's saw the development of a new technology for linking computer systems and workstations to each other in a local geographic area, the Local Area Network (LAN).

This presentation will focus on this merging of wide area and local area technologies. It will begin with a discussion of WAN and LAN goals, history, technologies, and examples. It will then discuss the current interconnection technologies of bridges and routers. It will conclude with a focus on the emerging issues in such interconnected networks.

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Stuart Wecker

is a leading authority in computer data networks. In 1972 Mr. Wecker joined Digital Equipment Corporation, where he designed and implemented a prototype distributed operating system built on a networked interprocess communication mechanism. This work led to his appointment as Network Architect, responsible for the definition of the Digital Network Architecture (DNA), the structure and design for the DECnet family of networking products. Mr. Wecker's work still forms the foundation for DECnet, and has provided the seeds for many other networks and current standards. He is now President of Interface Design, a consulting firm that focuses on problems of system interfacing and connectivity.

Live Satellite Broadcast

Making Work Fun

Presented By: David Abramis

Technical Professional Development Series
Monday, March 20, 1989
11:00 AM-1:00 PM, Eastern Time

Course Description:

Recent research in organizational psychology suggests that people's experience of "fun" in their work can improve their creativity, work motivation, mental health, and overall quality of life. The research also points to specific ways that work can be made fun. Participants in this seminar will learn:

- How people think about "fun" in work
- How fun in work affects work relationships, mental health, and job performance
- Strategies for making work more fun
- How to begin specific plans to do so

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

David Abramis

is Assistant Professor of Management, School of Business Administration at California State University in Long Beach. Dr. Abramis' research and management consulting focuses on ways organizations bring out the best in people. Abramis is currently managing several national research projects on the experience of "fun" in work, risk-taking, creativity and self-esteem. He has a B.A. from the University of California, and a M.A. and Ph.D. in Psychology from the University of Michigan.

NTU
Professional Development Programs

Live Satellite Broadcast

Signal Processing with Superconductive Circuits

Presented By: Theodore Van Duzer

NTU Technology and Management Symposium
Monday, March 20, 1989
1:00 PM - 3:00 PM, Eastern Time

Course Description:

Signal processing places ever-increasing demands on circuit performance and is, therefore, an application that can take advantage of the extensive capabilities of superconducter circuits. Some of the potential applications include high-resolution radar, signal-source identification, spread-spectrum communications, and infrared imaging. This seminar will discuss both analog and digital superconductive devices and will comment on the roles they can play in signal processing. Analog signal processors employ tapped transmission lines to achieve such functions as chirp filtering, spectrum analysis, convolution, and correlation. Superconductive analog-to-digital conversion offers the possibility of much wider bandwidth for a given dynamic range than their semiconductor counterparts. The circuit principles and potential results will be elaborated. Digital circuits including logic gates, memory cells, and shift registers will be described. These include OR gates with delays as low as 1.5 ps, a microprocessor with a cycle time of less than 1.0 ns, and shift registers shown in simulation to have clocking speeds as high as 60 GHz.

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Theodore Van Duzer

has taught on the faculty of the University of California at Berkeley since 1960. His research has centered on noise and focusing in crossed-field electron beam amplifiers. He is now engaged in teaching and research in electromagnetic theory, solid-state devices, and superconductivity. Professor Van Duzer has co-authored two books, *Principles of Superconductive Devices and Circuits*, and *Fields and Waves in Communication Electronics*. He received his Ph.D. from the University of California at Berkeley.

Live Satellite Broadcast

The Zero Sum Solution

Presented By: Lester Thurow

NTU Technology and Management Symposium
Monday, March 20, 1989
3:00 PM-5:00 PM, Eastern Time

Course Description:

America's central task of the next 25 years is to gain competitiveness. Unless this is done, our standard of living will continue to slip relative to that of the rest of the industrial world. Thurow tells how, having lost our previously effortless economic superiority and facing a world market filled with competitive peers, we must cope with this new reality. In this presentation, Thurow describes:

- The importance of education in the world class economy
- How to bring the quantity and quality of capital up to world class standards
- How to achieve the cooperation of labor and management
- What effort we must commit to research and development
- What contribution the government must make to the overall effort

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Lester Thurow

is a renowned economist who explains the effect of the global economy on America better than anyone. As Dean of the M.I.T. School of Management, Thurow is in a position to have significant impact on increasing the productivity and competitiveness of American corporations. His seminars stress the roles of management, education, technology and government in achieving long-term economic performance. He received his Ph.D. from Harvard, which awarded him the David A. Wells Prize in 1968. He is the author of the bestselling books *The Zero-Sum Society* and *The Zero-Sum Solution.*

Live Satellite Broadcast

Engineering Management: Managing High Tech Professionals in Our Turbulent Times

Presented By: Dr. Firdaus E. Udwadia

Members' Choice
Tuesday, February 28, 1989
1:00 PM - 5:00 PM, Eastern Time

Course Description:

Understanding the interaction between individual organizational and technical perspectives is necessary for enhancing productivity in technological organizations. This course, organized in a multiple perspective approach, will discuss various methods and techniques for managing high technology professionals. The following topics will be discussed:

- The multiple perspective approach to the management of high-tech organizations; the nature and causes of turbulence in our times.
- The engineering mind-set and management situations: changing the engineering mind-set to improve productivity.
- The culture of the high technology professional.
- Management of creativity and innovation in technological organizations: reward systems; control and monitoring systems; paradoxes of tele-working.
- Development of a set of heuristics for managing high technology professionals.

Sponsored By: University of Southern California

For more information contact your site coordinator or call NTU at (303) 484-0565

Dr. Firdaus E. Udwadia

is a Professor of Business Administration, Civil Engineering and Mechanical Engineering at the University of Southern California.

Intended Audience

This couse is intended for middle to upper management in technological organizations, especially managers in corporate laboratories, divisions and R & D facilities; human resource managers and management consultants.

Live Satellite Broadcast

The Strategic Manager: Planning in a Technical Environment

Presented By: Marla Bradley

Members' Choice
Friday February 10, 1989
11:00 AM- 5:00 PM, Eastern Time

Course Description:

During this program participants will develop skills in structuring planning activities in a technical environment; involving key team members in the planning process; integrating strategic and tactical plans; communicating strategic goals throughout the organization; translating strategies into daily decisions; revising plans to respond to changes in technology or the environment.

Topics covered will include:

- Session One-The importance of being a strategic manager
- Session Two -Identifying strategic issues
- Session Three -A structure for planning in technical organizations
- Session Four-A structure for planning in technical organizations (continued)
- Session Five - Implementation and follow through.

Sponsored By: University of Southern California

For more information contact your site coordinator or call NTU at (303) 484-0565

Marla Bradley

MBA, is currently President of the consulting company, Bradley-Lambert Management Specialists, which she founded following a corporate career in management. During the last 9 years she has worked extensively with executive and management teams assisting them in developing and implementing strategic plans.

Intended Audience
Managers in all technical and technical support organizations.

Live Satellite Broadcast

Semiconductor Processing Overview

Presented By: Anne Miller

Members' Choice
Tuesday, January 31, Wednesday, February 1, 1989
11:00 AM- 5:00 PM, Eastern Time

Course Description:

This course will provide information on all phases of the semiconductor manufacturing process to enable employees of Integrated Circuit (IC) manufacturing companies and organizations that manufacture equipment and materials for use by IC manufacturers to understand where their jobs (in the case of support industries, their products) fit and their importance to the whole.

Participants will gain familiarity with industry terminology and gain a broad perspective on the various steps required to produce functioning devices. Topics include:

- Supporting manufacturing technologies required by the IC manufacturer
- History and trends in the semiconductor industry
- Semiconductor manufacturing process: Layering, Patterning, Doping, Heat Treating
- Test and assembly
- Industry organizations, leaders and publications

Sponsored By: National Technological University

For more information contact your site coordinator or call NTU at (303) 484-0565

Anne Miller

is President of Semiconductor Services, an educational resources company founded in 1981 to meet the training needs of semiconductor manufacturers and their suppliers. She also heads Meyland Enterprises, a technical marketing consulting firm that focuses on product development and positioning.

Intended Audience

This course will benefit technicians and operators from Integrated Circuit manufacturing companies, engineers recently hired into the semiconductor manufacturing industry, sales and marketing staffs of companies who supply equipment and materials to IC manufacturers.

NTU
Professional Development Programs

NTU
Professional Development Programs
Monthly Feature

Winning the Productivity Race

Tuesday, December 13, 1988
11:00 AM - 5:00 PM Eastern Time

Speakers
Bernard N. Slade is Senior Management Consultant at United Research Company.
Raj Mohindra is Senior Technical Staff Member at IBM Corp.

Course Description
The seminar will cover the following topics:

- Technology and competitiveness; why U.S. industries have been losing to world competition.
- How to find the areas of greatest productivity leverage.
- How to accelerate the pace of innovation and technology.
- The productivity techniques and case studies to illustrate them; specific analytical techniques to achieve dramatic productivity increases and how to apply them.

At the conclusion of this seminar, participants will be able to determine the areas in their business which will have the greatest leverage in improving productivity, and where they can attain major gains in productivity through strategic allocation of resources to these areas. They will also be able to determine when to cut resources to reduce costs, when resource reallocations or even increases will result in greater productivity, and will be able to determine where they must concentrate development and manufacturing engineering.

Intended Audience
This seminar is intended for executives, middle managers, and technical professionals in engineering and manufacturing who are concerned with achieving lower costs, higher quality and faster innovation.

Contact your site coordinator for more information or call NTU at (303)484-0565

NTU
Professional Development Programs
Member's Choice

Environmental Management to Reduce Your Corporate and Personal Liabilities

Monday, December 12, 1988
1:15 PM - 5:00 PM Eastern Time

Speakers

Michael Graves, Mathew G. Livingood, and **Gordon D. Quin** are attorneys in the Environmental Department of Hall, Estill, Hardwick, Gable, Golden & Nelson and have over 26 years experience handling the complex issues involved in practicing environmental law.

Course Objective

Intense concern over hazardous substance risks have given rise to a new awareness of liability exposure and potential sanctions. This course offers an overview of federal and enforcement measures that delineate responsibilities and liabilities. It will also provide information about how to better utilize legal and technical resources. Specific strategies for managing risk and for complying with laws and regulations will be covered. These strategies include: statutory liabilities, nuisance, negligance, trespass, citizen suits, your criminal and civil liabilities, role of the courts, inspections, defenses, toxic torts, and some suggestions on *what you should do to protect your organization and yourself*. Topics to be covered are:

Introduction- •Regulatory mandates **Liabilities-** •A major concern **Major Environment Laws-** •Clean air act •Superfund and amendments •RCRA and amendments •OSHA •TSCA (PCB's) •Others **Common Law-Practical Suggestions-** •Actions to limit liabilities •Privileges, avoiding criminal liabilities due diligent review, etc •Contract documents, third party liabilities, enforcement and penalties, audits, plans, training programs, etc. •Getting out of the hazardous material business (Reducing volume and toxicity) **Hands-on Problem Solving Case Studies- Questions and Answers**

Intended Audience

This course is designed for (1) industries responsible for operations that involve the use or disposal of hazardous substances, (2) companies who own, lease or sell property on which hazardous substances may be used, stored or disposed and (3) lawyers, planners, consultants and policy-makers involved in programs related to hazardous substance issues.

Contact your site coordinator for more information or call NTU at (303)484-0565

Reducing Corporate Risk Through Proper Hazardous Waste Disposal

November Members' Choice

SPEAKERS: Wayne C. Turner is a Professor in the school of Industrial Engineering and Management at Oklahoma State University in Stillwater.

Rick Webb and Jim Shirley are partners in the consulting firm of Webb & Shirley Management Consultants, Inc.

SESSION OBJECTIVE: This course examines the full scope of hazardous waste disposal options and discusses the advantages and disadvantages of each option. Participants will gain a thorough understanding of:

Solid waste landfill
Effluent discharge to the environment
Effluent discharge to the POTW (Public Owned Treatment Works)
RCRA disposal

- Hazardous waste landfill
- Injection well
- Recycling
- Incineration
- Fuels burning
- Delisting
- Chemical destruction

SESSION DESCRIPTION: In each of the above options, the instructors will first describe the option in depth with slides and tapes to help illustrate. Then, appropriate regulations will be reviewed, followed by a discussion of the advantages and disadvantages of each. Finally, a listing of the potential sites for each option will be given when appropriate.

INTENDED AUDIENCE: The course is designed primarily for those who must choose the disposal method for hazardous waste within their organizations.

COURSE MATERIALS: One set of reproducible course notes will be sent to each registered site.

SCHEDULE: One 3 3/4-hour, live session:

Monday, November 28, 1988
1:15 AM - 5:00 PM, Eastern Time

SPONSOR: Oklahoma State University

FOR MORE INFORMATION, CONTACT:
OR CALL NTU AT (303) 484-0565

Correctly Applying Statistical Process Control Tools

November Members' Choice

SPEAKER: Kenneth E. Case is a Regents Professor of Industrial Engineering and Management at Oklahoma State University.

SESSION OBJECTIVE: Ongoing process improvements can be realized only if correct SPC techniques are selected for the process being considered. This course is designed to provide the information necessary to allow the right decisions.

SESSION DESCRIPTION: Course Outline:

- Concepts and Principles of Quality Control
- Concepts and Principles for a Working SPC System
- Methods of Looking at Processes – Flow Charts, Cause and Effect Diagrams, Pareto Charts, and Check Sheets
- Methods of Looking at Data – Variables, Histograms, Measures of Central Tendency, Measures of Variation, Normal Distribution, Statistical Inference and Sampling Distribution
- Using Control Charts – X-Bar and R Control Charts, Moving Average and Moving Range Charts, Individuals and Moving Range Charts, Comparison of X-Bar, R; MA, MR; and I, MR(2) Charts
- The Effects of Autocorrelated Data in Continuous Processes
- Process Capability Analysis
- Reading and Interpreting Control Charts
- Effects of Measurement Error and What to Do About It
- Using Attribute Charts: p, np, c and u Charts
- Introduction to Correlation/Regression Analysis
- Introduction to Design of Experiments

INTENDED AUDIENCE: This course is for those involved in manufacturing of either discrete parts or continuous/batch processes and the operation of test laboratories, who wish to review, plan, or expand applications of SPC. Typical participants include engineers, technicians, supervisors and managers from Manufacturing, Technical Sales, Purchasing, Laboratory, Quality, and Technical functions.

COURSE MATERIALS: One set of reproducible course notes will be provided to each registered site.

SCHEDULE: Three 6-hour, live sessions:

Tuesday, November 22, 1988
Tuesday, November 29, 1988
Tuesday, December 6, 1988
11:00 AM - 5:00 PM, Eastern Time

SPONSOR: Oklahoma State University
FOR MORE INFORMATION, CONTACT:
OR CALL NTU AT (303) 484-0565

How to Prepare Your Firm for an Environmental Audit

November Members' Choice

SPEAKERS: Wayne C. Turner is a Professor in the school of Industrial Engineering and Management at Oklahoma State University in Stillwater.

Rick Webb and Jim Shirley are partners in the consulting firm of Webb & Shirley Management Consultants, Inc.

SESSION OBJECTIVE: This broad coverage of the latest changes in environmental audits may prevent you from being caught unaware. Participate in this intensive video course to prepare you and your company for an EPA audit.

SESSION DESCRIPTION: Course Outline:

Course Introduction and Objectives Environmental Audits

- Who conducts them?
- How are firms "chosen"?
- What common problems are found?
- How can I prepare?

Correcting Deficiencies Environmental Updates Conducting Your Own Environmental Audit

- What procedure?
- Who conducts it?
- Checklist?
- Workshop -- an opportunity for you to conduct an audit of a facility

COURSE MATERIALS: One set of reproducible course notes will be provided to each registered site.

INTENDED AUDIENCE: Environmental managers and coordinators, plant engineers, managers of operations, or anyone who is held responsible for environmental affairs will profit from this course.

SCHEDULE: One 3 3/4-hour, live session:

Monday, November 21, 1988
1:15 AM - 5:00 PM, Eastern Time

SPONSOR: Oklahoma State University
FOR MORE INFORMATION, CONTACT:
OR CALL NTU AT (303) 484-0565

7-22-88

NTU

Tape Delayed Satellite Broadcast

Managing Your Company with Tom Peters

Tape Delayed Seminar
November 14, 1988
1:00 PM - 3:00 PM, Eastern Time

Course Description

Learn how American companies can survive in today's (and tomorrow's) turbulent economic/ political world. One of the nation's foremost authorities on business management and economics. Peters will offer insight into successful business technologies during the presentation. The course will cover the following points:

- The world turned upside down: the new competitive context
- Sustained, strategic advantage through creating the customer-obsessed company
- Innovate or die: in search of more tries and of radically reduced product/service development cycle times
- Quality, service and innovation through people: the structural and motivational keys to enhanced and sustainable commitment
- The new business leadership: creating a unique vision, MBWA and a bias for action

Tom Peters

is co-author of *In Search of Excellence* and *A Passion for Excellence;* the first, second, and only management books ever to rank #1 on The New York Times national bestseller list. Peters is also the founder of the Palo Alto Center for Management Studies, and the Tom Peters Group of California. He writes a weekly syndicated newspaper column for Tribune Media Services and appears bi-monthly on two business news television programs. Peters has a masters degree in engineering from Cornell and a Ph.D. in business from Stanford

Sponsored by Old Dominion University

For more information contact your site coordinator
or call NTU at (303)484-0565

NTU
Professional Development Programs

Live Satellite Broadcast

Design and Synthesis of Ceramic Materials Principles and Practices

Presented by: Dr. Rustom Roy

Member's Choice
Friday, October 28, 1988
11:00 AM-5:00 PM Eastern Time

Course Description:

This course will outline the scientific principles in crystal chemistry and phase equilibrium, discuss the various kinds of equipment necessary, and illustrate the applications of both to a variety of examples of current interest: fine powders, zero expansion ceramics, electronic composites/nanocomposites/CVD diamonds, superconductors, etc.

Topics include:

- Background Needed, (i.e., The Place and Importance of New Materials Synthesis in Materials Research Today, etc)
- The Scientific Bases (=Software) needed for RME
- State-of-the-Art Case Study I-New Zero Expansion Ceramic
- State-of-the-Art Case Study II-Second Generation Solution Sol Gel Derived Nanocomposites
- The Comparison of Three Major Advances: CVD Diamond Films, Lanxide, High Tc Superconductors.

For more information contact your site coordinator or call NTU at (303)484-0565

NTU
Professional Development Programs

Dr. Rustum Roy

Evan Pugh Professor of the Solid State and Professor of Geochemistry at Pennsylvania State University. He is the director of the biggest U.S. University laboratory specializing in materials synthesis, and serves as Director of the Science, Technology and Society Program of the University. He is also the University's senior member of the U.S. National Academy of Engineering. He has been involved in science policy matters for two decades at the Federal and State levels. He is an active scientist who has published 500 papers and five books and has won many awards.

Professor Roy is one of the nation's leading ceramic scientists. He developed the sol-gel process starting in 1948, and in the fifties exploited hydrothermal and high pressure synthesis for making new ceramics and determining phase equilibrium diagrams. He was a pioneer in the synthesis of clays and the development of ceramic phases as radioactive waste hosts. His recent work is on di-phasic gels as a route to nanocomposites, and the discovery of new zero expansion ceramic phases and CVD diamond films.

NTU
Professional Development Programs

Design and Synthesis of Ceramic Materials Principles and Practices

Member's Choice
October 28, 1988
11:00 AM - 5:00 PM Eastern Time

Speaker
Rustum Roy is Evan Pugh Professor of the Solid State and Professor of Geochemistry at Penn State University. He is the director of the biggest U.S. University laboratory specializing in materials synthesis, and serves as Director of the Science, Technology and Society Program of the University. He is also the University's senior member of the U.S. National Academy of Engineering. Professor Roy was awarded an honorary doctorate by the Tokyo Institute of Technology, and is an elected foreign member of the Royal Swedish Academy of Engineering Sciences and the Indian National Science Academy. He has been involved in science policy matter for two decades at the Federal and State levels, and in the private sector as first chair of the National Council of Churches Committee on Science, Technology and the Church. He is an active scientist who has published 500 papers and five books and has won many awards.

Professor Roy is one of the nation's leading ceramic scientists. He developed the sol-gel process starting in 1948, and in the fifties exploited hydrothermal and high pressure synthesis for making new ceramics and determining phase equilibrium diagrams. He was a pioneer in the synthesis of clays and the development of ceramic phases as radioactive waste hosts. His recent work is on di-phasic gels as a route to nanocomposites, and the discovery of new zero expansion ceramic phases and CVD diamond films.

Course Description
This course will outline the scientific principles in crystal chemistry and phase equilibrium, discuss the various kinds of equipment necessary, and illustrate the applications of both to a variety of examples of current interest: fine powders, zero expansion ceramics, electronic composites/nanocomposites/CVD diamonds, superconductors, etc.

NTU
Professional Development Programs
Member's Choice
October 28, 1988
11:00 AM - 5:00 PM
Eastern Time

Broadcast Schedule

11:00 - 11:05 - Introduction

Session I - 11:05 - 12:00 - Background Needed

•The Place and Importance of New Materials Synthesis in Materials Research Today •Post WWII Advances in Ceramics Dependent on New Materials and New Processes •The Algorithm for a Systematic Approach to Materials Synthesis •The Hardware Needed for Rational Molecular Engineering (RME)

12:00 - 12:30 - Lunch Break

Session II - 12:30 - 1:25 - The Scientific Bases (=Software) Needed for RME

A). Crystal Chemistry

•How to predict crystal structure from given composition •How to predict crystalline (solid) solubility • How to relate gross properties to composition-structure •How to predict nature and kinetics of solid state reactions

B). Phase Equilibrium (Quantitative Crystal Chemistry)

•(Predicting and) Reading off number of compounds •Strength of compounds from S-L, S-V curves •Crystalline solubility •Phase Transitions P-T-X

1:25 - 1:35 - Break

Session III - 1:35 - 2:30 - State-of-the-Art Case Study I - New Zero Expansion Ceramic

•First Approach - Modify existing structures •Second Approach - Use first principles on empirical theory to search for new structures, then modify composition •Third Approach - Make a (nano) composite

2:30 - 3:00 - Lunch Break

Session IV - 3:00 - 3:55 - State-of-the-Art Case Study 2 - Second Generation Solution Sol Gel Derived Nanocomposites

•Conceptual benefits of di-phasicity •Structural di-phasicity shows-Lowering of reaction (and sintering) temperature, Grain refinement of microstructure, Control of phase formed •Double di-phasicity -Control of morphology, increase of effects Compositional multi-phasicity- Drastic lowering of sintering temperatures

3:55 - 4:05 Break

Session V - 4:05 - 5:00 - Comparison of Three Major Advances: CVD Diamond Films, Lanxide, High Tc Superconductors

•The three discoveries and how they have been handled/mishandled by Government and Industry •CVD diamond films -Soviet and Japanese basics, Penn State research •Lanxide-Revolutionary process for making ceramic composites, Unique basis in L & V– S reaction, some examples •High Tc superconductors-History of discovery in Zurich, Alabama, Peking, Bangalore, Illustration of the limitation of the state-of-the-art of materials synthesis.

Contact your site coordinator
for more information
or call NTU at
(303)484-0565

Planning and Managing a Computer Integrated Manufacturing Initiative

October Members' Choice

SPEAKER: Joe H. Mize is Regents Professor of Industrial Engineering and Management of Oklahoma State University. He is also Director of the Center for Computer Integrated Manufacturing at OSU. In addition, he consults extensively with several major corporations on advanced manufacturing system design. Dr. Mize is the author of five engineering textbooks and numerous technical articles. He is a frequent speaker at conferences around the world on advanced manufacturing systems, especially computer integrated manufacturing. He is a Fellow and Past President of the Institute of Industrial Engineers and is a member of the National Academy of Engineering.

COURSE OBJECTIVES: This course is will provide participants with a comprehensive and cohesive framework for planning and managing a company's efforts to achieve a computer integrated manufacturing environment.

COURSE DESCRIPTION: The manufacturing world is experiencing rapid and pervasive changes; so much so, that many people are saying that we are experiencing a "second industrial revolution." A rapidly growing number of nations are emerging as very capable competitors in the battle to win market share in the global market place. Processes, practices, procedures, organizational arrangements, and management approaches that worked well in the factories in the 1950's and 1960's are falling short in the new competitive environment.

Computer-Integrated Manufacturing (CIM) is emerging as an effective approach to the organization and management of a manufacturing firm. The basic concept upon which CIM is based is that the functions of design, production, and production management are mutually rationalized and completely coordinated, through the appropriate use of systems engineering principles implemented with computer and information/communication technologies.

Achieving a CIM environment is not easy, but those organizations which are beginning to have some success in doing so are experiencing significant gains in responsiveness, product quality, on-time deliveries, manufacturing velocity, and other performance criteria which are crucial to the attainment of the organization's strategic business objectives.

This intensive workshop will explore the fundamental issues associated with achieving a CIM environment. A logical framework is presented for preparing the organization for CIM planning, conducting the detailed analysis, creating the CIM plan (a transition path from where we are to our vision of where we want to be), and managing the implementation of the plan. Behavorial, organizational, and managerial issues are covered, in addition to technical issues.

INTENDED AUDIENCE: Managers and technical personnel who are responsible for the long-term survival and competitiveness of the manufacturing component of their businesses and for the logical integration of all functions of the business into a cohesive system. Also, leaders and members of task forces whose charge is to create a strategic plan for modernizing the factory. This could also include engineers and other technical personnel who might be involved in modernization planning.

COURSE MATERIALS: A set of notes and presenter's biographies will be sent to each site.

SCHEDULE: Three, 4-hour, live interactive session.
Friday, October 7, 1988 **Tuesday, October 11, 1988** **Thursday, October 13, 1988**

1:00 PM - 5:00 PM Eastern Time

SPONSOR: Oklahoma State University

FOR MORE INFORMATION, CONTACT:
OR CALL AMCEE AT (303) 484-0565

BEST COPY AVAILABLE

Surface Contamination and Cleaning

October Monthly Feature

SPEAKER: Dr. Kashmiri Lal Mittal is currently associated with IBM Corporate Technical Education, Thornwood, New York. His expertise includes development and teaching of courses dealing with contamination control technology, interfacial phenomena, surface mount technology, plasma technology, polymers in microelectronics, and other topics in the realm of materials and processes for microelectronics. Dr. Mittal has been a preeminent force in developing and organizing a number of successful symposia in the surface sciences. He is the editor of more than 20 books and the author of 50 papers in the areas of surface and colloid chemistry, adhesion, and polymer science. Mittal was recently appointed chairman of the newly formed Contamination Control Division of the Fine Particle Society. He holds an editorial position with the Journal of Adhesion Science and Technology (VNU Science Press, Utrecht, the Netherlands) and is also a member of the editorial boards of Solid State Technology, Advances in Colloid and Interfacial Science, and the Journal of Polymer Materials. He holds BS and MS degrees in chemistry and a PhD (1970) in colloid chemistry from the University of Southern California.

SESSION OBJECTIVE: This course will deal with the concepts, principles, applications, effects or results, and limitations of techniques for various areas of clean surface technology. It is applicable to the areas metals, ceramics, glass or plastic.

SESSION DESCRIPTION: The detrimental effects of surface contamination can be felt in many diverse technologies, including adhesion, composites, absorption, tribology, soldering, device fabrication, and printed circuit boards. In the submicrometer geometries of microelectronics, a micrometer-size particle has the potential to be disastrous. There is a definite need to understand why surfaces get contaminated and how to clean them and keep them clean. This course will cover the following areas:

- Sources and causes of contamination
- Techniques for cleaning surfaces
- Techniques for characterizing the degree of cleanliness
- Storage of clean parts
- Implications of surface contamination

INTENDED AUDIENCE: This course should interest anyone dealing with semiconductors, microelectronics, coatings, or those technical professionals in the aerospace or biomedical fields.

COURSE MATERIALS: One set of course notes to be reproduced for all participants will be sent to each registered site.

SCHEDULE: Two 6-hour, live sessions:

Tuesday, October 18, 1988
Wednesday, October 19, 1988
11:00 AM - 5:00 PM, Eastern Time

SPONSOR: NTU
FOR MORE INFORMATION, CONTACT:
OR CALL NTU AT (303) 484-0565

7-22-88

NTU